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Contents

Editor's foreword.....	vii
Teacher Shortages in Sub-Saharan Africa: An Exploration of Challenges and Mitigation.....	1
Gbolagade Adekanmbi	
A blended teacher education model for open and distance learning universities in low- and middle-income countries achieving Sustainable Development Goal 4.....	16
Md Meraz Ahmed	
Distance Reimagined: The Collective Doctoral Journey of Six Wonder Women (WW)	39
Rima Al-Tawil, Chadia Mansour, Kathryn Johnson, Margaret Rauliuk, Mae Doran, and Saudia Jadunandan	
In-service Teacher Education Assessment Literacy: Deconstructing Distance Education Students' Perceptions.....	60
Mary Ooko and Ruth Aluko	
Exploring 2D Metaverse Platforms at the Open University of Japan.....	61
Kumiko Aoki	
Development of a Novel Distance Taught University-based Training in EMDR Therapy	72
Elliot Bell, Zara Mansoor, MaryAnn Stevens, Tom Flewett, Susanna Every-Palmer, and Ben Daniel	
Collaborative Innovation for Inclusive and Sustainable Education Systems: Lessons from Northern Sweden	88
Martin Bergvall and Ulf Hedestig	
Reappraising Discussion Forums in Graduate Education for the GenAI Era	105
Constance Blomgren, Aga Palalas, and Adnan Qayyum	
Transformative Effect of Generative AI on Tertiary Library Services in Higher Education	117
Eric Boamah, Simon Park, and Ibrahim Rahman	
Opening Doors on ODFL With 'Video Chat': Adding Synchronous Academic Support To Asynchronous ODFL Delivery	136
Lynette Brice	
The Culminating Integrative Assessment in Initial Teacher Education: Challenges and Benefits	137
Lynette Brice, Melissa McMinn, and Kirsten Price	
Predictive Diagnostic Evaluation: Strategy for Student Retention in Basic Education in Brazil	138
Renato de Oliveria Brito, Luis Paulo Leopoldo Mercado, Gilvan Charles Cerqueira Araújo, and Maria Cristina Mesquita da Silva	
Ubuntu* in Education: AI for Open Learning and Indigenous Knowledge Integration.....	151
Janet Bruce-Brand and Surika Civilcharran	

Evaluating quality online course design: The impact of creating, implementing and using the TELAS framework	153
Chris Campbell, Lisa Jacka, and Elaine Huber	
Learner Support and AI: From Assumptions to Realities: A Systematic Review	154
Berrin Cefa and Olaf Zawacki-Richter	
STEM Teacher Training and Digital Empowerment in the South Pacific: A Dual Perspective	155
Rajni Kaushal Chand, Riteshni Lata, Mohammed Juned Hussein, and Barnabas Sahayam	
Learners' reflection on the use of ePortfolio in Social Work at the University of the South Pacific ...	162
Irene Yee Chief and Soroepeli Ramacake	
Constructive Alignment as a Framework For Faculty Development in an Age of AI.....	173
Inger-Marie Falgren Christensen, and Pernille Stenkil Hansen	
Achieving Viable and Sustainable Education at the Community College Level	190
Carolee Clyne, Joan Ragsdale, Jordan Perrey, Neil Fassina, Samantha Lenci, and Paul Martin	
Exchanging Ideas for Inclusive, Scalable and Sustainable Education.....	205
John Cribbin	
The Distance Learning Platform for Crypto Enthusiasts: Learn Blockchain, Build the Future: Anywhere, Anytime	218
Fatia Fatimah	
Bridging AI Literacy & Information Evaluation within the Information Literacy Space.....	233
Angela Feekery and Rupena Tawhai	
Enhancing Education through Resource Sharing in the European University Model: The Case of Cybersecurity and Beyond.....	252
Mariusz Głąbowski, Teofil Jesionowski, Maciej Sobieraj, and Michał Weissenberg	
Reconciliation in Action: Deepening Awareness of Bias and Racism Through Collaborative Introspection	269
Ashley Gollert	
Open Educational Resources and Digital Curation: Possible Paths to Sustainable Education	283
Elevângela Ferreira Gomes, Cristine Martins Gomes de Gusmão, and Adriele Gleice Alves da Silva	
Bridging Design Prototypes: A Design Tool to Resource Sustainable, Equitable, and Flexible Learning	301
Gloria Gomez	
AI Chatbot in an ODFL Learning Environment: A Trial	318
Anna Gubinskaya and Renu Joshi	
AI and the Evolution of Research and Learning Design: A Digital Ethnography of Emergent Practices and Perspectives.....	337

Angela Gunder, Joshua Herron, Nicole Weber, and Colette Chelf	
Advancing Opened Culture in an AI-Enabled World	348
Angela Gunder, Joshua Herron, Nicole Weber, Colette Chelf, & Melody Buckner	
AI and the Future of Institutional Leadership: Global Collaborations for Strategy and Innovation....	364
Angela Gunder, Melissa Vito, Claudia Arcolin, and Marcela Ramirez	
Beyond Prediction: Leveraging Storytelling to Reimagine the Future of Learning	377
Angela Gunder, Melissa Vito, Lev Gonick, Samantha Becker, Ruben Puenteadura, and Melody Buckner	
Academic Innovation in Practice: Strategies for Transforming Institutional Culture	394
Angela Gunder, Melissa Vito, Marcela Ramirez, and Cristi Ford	
Reimagining Educational Futures Based on Nature-Based Solutions (NBS): Open Educational Ecoterritorialization in Postgraduate Research Projects.....	407
Cristine Martins Gomes de Gusmão,, Neferson Barbosa, & António Rochette	
Open Pedagogy: Innovation in the Classroom with Inclusive OER	422
Cristine Martins Gomes de Gusmão, Danúbia Charlene da Silva Pontes Ribeiro, and Neferson Barbosa	
Inclusive OER Taxonomy for Complementary and Integrative Practices in Brazil's Public Health	438
Cristine Martins Gomes de Gusmão,, Danúbia Charlene da Silva Pontes Ribeiro, Willys Jathyles Candido, and Joaquim Luis Alcoforado	
Posthumanism and Open Education Philosophies in ODeL: Intersections, Tensions, and Embodied Pedagogies: A Scoping Review	457
Dené Hees and Sindile Ngubane	
Tauira Māori Achievement in a Kaupapa Māori Ako (Educational) Setting: Barriers and Opportunities	476
Rebecca Kiddle, Tara McAllister, Shelley Hoani, Jen Archer-Martin, Dianne Menzies, Tutakangahau Williams, Te Mihinga, Griffa Rivers, Dion O'Neale, Morehu McDonald, Mitra Homolja, Ellie Tuckey, and Liya Kanakkappally Antony	
Site-Centric Augmented Learning for Personal Experience in Outdoor Environments	503
Gill Lawson, Tracy-Anne De Silva and Terry Meechang	
The Transformation of AI-Driven Educational and Training Resource Development Models and Ecological Reconstruction: Practice and Outlook of the Central Agricultural Broadcasting and Television School	523
Chen Lei and Si Yang	
A Rose by Any Other Name: AI Augmented HyFlex Learning	529
Julie Lindsay and Lisa Jacka	
A Future Beyond Mass Education: Higher Education as an Integrity Institution	530

Stephen Marshall

How Universal Design for Learning Enhances Distance Postgraduate Learning In Aotearoa New Zealand	531
Helen Mataiti, Amy Benians, and Rachel McNamara	
Policy, Practice, and Quality in a Distant Education Model: Challenges and Innovations in Teaching International Students.....	550
Mathew Thomas	
Review of the Legislation and Quality Framework for Distance Education in Brazil.....	563
Joao Mattar	
The Role of Micro-credentials in Addressing Educational Issues in the English-speaking Caribbean.....	575
Rory McGreal and Eduardo Ali	
Ako: Rethinking Teacher Professional Learning in Education for Sustainability	589
Fariba Mostafa	
Books and Babies: Pregnant People and New Mothers' Experiences of Online Distance Education .	600
Samantha Murphy, Sally Ogut, and Sharon Mallon	
Storytelling for Digital Content Development	601
Paulina Pannen, Felix Pasila, Rahayu Dwi Riyanti, and Afriani	
Co-Designing AI Guidelines Through an AI Literacy Lens	618
David Parsons, Kathryn MacCallum, and Stephen Powell	
Assessment of Vocational Education on Online, Distance, Flexible Learning Environments.....	633
Katherine J. Quigley and Peter Yongqi Gu	
Self-Regulated Learning in Blended and Online Education within Learning Ecologies Framework....	652
Albert Sangrà Morer, Montse Guitert-Catasús, Teresa Romeu-Fontanillas, and Marc Romero-Carbonell	
Ownership of Learning in Distance Education: Building Accessible and Resilient Pathways to Lifelong Learning.....	670
Maximus Gorky Sembiring	
Transforming Distance Education: Impact of GenAI on Learning Patterns and Student-Academic Interactions	686
Maximus Gorky Sembiring	
Actioning the CoI framework and GenAI for Collaborative Learning in a Large Online Course in the Global South.....	702
K Sevnarayan	
Addressing the Needs of University Students with a Mental Health Condition: Tutors' and Students' Views	723

Joan Simons and Catrin Macaulay

Leading through Uncertainty: The Three Cs Approach to Inclusive, Scalable and Sustainable Leadership in Higher Education	742
Dianne Stratton-Maher, Ebba Ossiannilsson, Evangelia Manousou, and Prakash V. Arumugam	
Artificial Intelligence's Impact on Transformative Learning in Higher Education	764
Wen Tang and Xiangyang Zhang	
Digital Curation, Open Science, and the Context of Educational Repositories	781
Katia Maria Tavares Da Silva, Cristine Martins Gomes de Gusmão, and Neferson Barbosa da Silva Ramos	
Using Interactive Oral Assessments for Equity in Postgraduate Online Courses in Aotearoa New Zealand	796
Herbert Thomas, Dorcas Kayes, and Anna Johnstone	
Tūhononga (Connection), Noho Rangapū (Collaboration) and Whakatutuki (Completion): Graduate Experiences of Distance Academic Mentorship/Research Master's Supervision	811
Yvonne Thomas, Suzanne Miller, Helen Papuni, and Sally Baddock	
Artificial Intelligence in Sustainable Teacher Education: Readiness and Perspectives of Pre-Service Teachers in Open Distance Learning.....	828
Geesje van den Berg	
Community of Inquiry Framework: Alignment with Indigenous Ways of Understanding	844
Norman Vaughan	
Generative AI in Teacher Education: From Theory to Practice	863
Norman Vaughan	
Mobilization through Digital Social Networks for the Professional Development of Higher Education Academics: A Collaborative Construction on the OBSERVA Portal	887
Dilmeire Vosgerau, and Maria Fernanda Moretti Schneider	
OBSERVA Portal: Academics' Pedagogical Development through Storytelling and Digital Curation..	906
Dilmeire Vosgerau and Caroline Carmona Marques Gonçalves	
Indigenous Knowledge Transfer in the Age of AI: The Place of AI and Opportunities for Future Use In Indigenous-Centred Distance Education	929
Hemi Whaanga and Huia Jahnke	
Digital Nomadism as a Didactic Pattern in Higher Education	946
Carsten Wolff, Mrs Nargiza Mikhridinova, Iuliia Mende, Jennifer Voßgerau, Ekaterina Hermann, Thorsten Ruben, Carolina Cruz-Villazon, Maider Iturrondobeitia Ellacuria, Peter Arras, Bassam Hussein, Elena Vitkauskaitė, and Rūta Čiutienė	
A Scalable, Cost-Effective Hybrid AIG Workflow for Engineering Item Banks.....	965
Luchen Xia, Maria Elena Villapol and Cynthia Ogilvy	



Is Open, Distance, and Digital Education (ODDE) good for the environment? A systematic review of carbon footprint studies.....	983
Olaf Zawacki-Richter and Berrin Cefa	

Editor's foreword

These proceedings from the 30th International Council for Distance Education (ICDE) World Conference 2025 represent some of the best research about online, distance and flexible education from around the world.

The theme for the conference was **Ako: Exchanging ideas for inclusive, scalable, and sustainable education**. The Māori concept of 'ako' means reciprocity in learning and teaching, the exchange of ideas. These proceedings will support ongoing engagement among distance education researchers as well as documenting the activity of the conference itself. Anyone seeking an overview of current research will find these proceedings valuable.

Papers include innovative practice, new developments, and novel theoretical frameworks and approaches, across all levels of education from K-12 through to higher education including vocational education.

Papers were linked to the Sustainable Development Goals, and topics include: assessment, micro-credentials, institutional culture, sustainable education and education systems, learning design, professional education for academics and teachers, student experience of distance education, evaluation frameworks, inclusivity and scalability, and Indigenous knowledge and knowledge transfer (among many others). Artificial intelligence features prominently and from many angles (including a focus on AI literacy), although not at the expense of other themes.

I would like to thank my co-editors, Dr Bronte Carr, who was largely responsible for editing the concise talk, workshop/panel, and poster abstract volume, and Dr Claire Goode, who assisted with the full papers volume. We acknowledge the support of Southland Institute of Technology (SIT) in providing Dr Carr's time for this work.

Dr Amanda Cossham

March 2026

Teacher Shortages in Sub-Saharan Africa: An Exploration of Challenges and Mitigation

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ABSTRACT

This paper examines the problem of teacher shortage in sub-Saharan Africa, against the background of a general global teacher shortage, albeit, with more serious consequences for the sub-continent. While education and training in the sub-continent are carried out by various agencies, including government, private institutions and open and distance learning institutions, teacher shortage is still a major problem. Using documentary evidence from global reports and reviewed empirical studies, the author highlights challenges such as teacher migration, gaps in quality provisions, inadequate professional learning community models, inadequate financing, and others. The paper's mitigation routes include a proper implementation of the Commonwealth Teacher Protocol, expansion of recruitment modalities, use of micro credits, use of open educational resources, use of qualifications frameworks and regulatory agencies, continuing collaboration and partnership, and the promotion of professional learning communities.

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INTRODUCTION

The world currently faces a major global challenge of teacher shortages, with developed and developing economies similarly affected, but with sub-Saharan Africa more so. In the Global Report on Teachers by UNESCO (2024), the problem of teacher shortage across the globe was extensively examined, where 44 million additional teachers WILL to be required in primary and secondary schools alone (UNESCO, 2024). The global north and south suffer the same challenge, albeit with greater intensity in sub-Saharan Africa, where 15 million more teachers are needed in the primary and secondary school context. While 5,368,000 teachers are required to address staff attrition, 9,411,000 are needed as new teaching personnel (UNESCO, 2024). To achieve the United Nations Development Goal 4 (SDG4) which is aimed at aims ensuring inclusive, equitable quality education and also promote lifelong learning for all by 2030, at least 7 out of 10 teachers are needed at the secondary level globally (UNESCO, 2024). Due to sub-Saharan Africa's own plethora of socio-economic problems, the challenge becomes more pronounced. Beyond the numbers that require continuing scaling, quality is also an issue. It is hoped that open and distance learning (ODL), developments in the use of micro-credentials, use of qualifications networks, and digitalization may provide ways out of the problem.

OBJECTIVES

Against this background, this paper examines the problem of teacher shortage in sub-Saharan Africa, with a focus on its challenges and mitigation. It profiles the sub-Saharan African context, in terms of economy, education, digital development, and general wellbeing. It explores current practices in teacher training, and how ODL has been a mitigating tool to address teacher shortages, including the use of micro-credentials, open educational resources (OER) and the work of distance education associations. It also explores qualification networks and quality enhancement strategies aimed at mitigating the present challenge. The paper further explores current initiatives at the UNESCO Teacher Task Force and others such as the Global Network of Deans of Education (GNDE) and the African Deans of Education Network (ADEF). The thrust of the submission is that there are multiple ways of mitigating the teacher shortage challenge and enhancing the quantity and quality of teacher provision in sub-Saharan Africa.

METHODOLOGY

This paper uses documentary analysis to explore the issues and relies on UNESCO documents, relevant United Nations Development Programme (UNDP) publications, data on schooling and tertiary enrolment ratios from the World Bank, and submissions from the African Federation of Teaching Regulatory Authorities (AFTRA), the GNDE documents to support the arguments put forward. It identifies dominant themes in the reviewed documents to analyse trends and proffer solutions to the intractable problem.

DISCUSSION

The Context: Sub-Saharan Africa

Sub-Saharan Africa (SSA) consists of 46 countries, with a population of 1.29 billion (Statista, 2025). The sub-continent has an adult literacy rate of 68% in 2023, compared to the Middle East and North Africa (MENA) countries with 81%; and 97% for the Organisation for Economic Co-operation and Development (OECD) member countries, with a world average of 87% (World Bank, 2024a). For

primary school enrolment, the gross enrolment ratio (GER) for sub-Saharan Africa (SSA) was 98% in 2023, for the MENA countries, it was 98%, for OECD member states, it was 100%, and 102% for the whole world (World Bank, 2024b). For secondary school enrolment, the GER for SSA was 45% in 2023, 81% for MENA countries, 105% for OECD countries and 73% for the world (World Bank, 2024c).

In the UNDP report for 2025, the expected years of schooling is 10.3 for SSA, 16.5 for Arab states, 12.0 for OECD member countries and 13.0 for the world (UNDP, 2025). In the same period, the gross national income for SSA was \$4,352, \$15,825 for the Arab states, \$52,698 for OECD member countries and \$20,327 for the world (UNDP, 2025; US dollars). While these are clearly contrasting figures when SSA is compared with the rest of the world, and especially the advanced OECD countries, the annual human development growth for the 2010-2023 period shows a different scenario for SSA. For SSA, it was 0.83 %, for Arab states, 0.54%, for OECD member countries, 0.28%, and for the world, the average was 0.52% (UNDP, 2025).

In the primary and secondary school contexts, the pupil teacher ratio, based on the figures available from the World Bank (2024), the ratio in primary school for the region in 2018 was 37:1, for MENA countries, it was 21:1, for OECD member countries, it was 15:1 and the world average during the period was 23:1. For secondary schools, SSA's ratio was 22:1, for MENA countries, 15:1, for OECD member countries, 14:1, and for the world, it was 17:1 in 2018.

On communications technology, the International Telecommunications Union, (ITU, 2024), in its publication, *'Measuring Digital Development Facts and Figures 2024'*, the body notes that the global average for internet use in 2024 was 68% when the figure for Africa as a whole stood at 35%. At the same time, mobile phone ownership in Africa was at 66% while the global average stood at 80%. For the Arab states, internet use was 70% while mobile phone ownership was 83% in 2024. Furthermore, the disparity between urban and rural areas was underscored. Globally, in the urban areas, the use of internet was 83% and 48% respectively. In Africa, the urban population and the rural areas had a 57% and 23% usage respectively.

The observations from the above are that the SSA countries, when compared with their counterparts in the OECD countries, and even the Arab states as in the MENA countries, are still relatively poorer, have lower literacy rates, have higher pupil-teacher ratios, use the internet less, have lower mobile phone ownership, and are assumed to be able to communicate more through the use of new technologies. In their rural settings, the problems raised are more expansive, as the urban rural divide is more problematic for the Africans than their counterparts either in the Arab states or in other parts of the world. In short, sub-Saharan Africans are still playing catch-up in terms of technology of communication, with obvious impact on teaching and learning, and in this case, the running of ODL for teacher training may be affected. The only bright light is that sub-Saharan African countries seem to be experiencing a slightly higher annual development growth when compared with the rest of the economic blocks. This portends hope, especially if the gains in growth are reflected in changes in programmes or pursuits in time.

Exploring Teacher Education and Training

Generally, teacher education and training in SSA is conducted by a variety of institutions, mostly universities and colleges of education, but with governments having overarching roles in policy directions, and through its established agencies, the accreditation of such programmes. In exploring the trends, qualifications vary from certificate to diploma and degrees, including the postgraduate

certificate or diploma in education, usually reserved for those coming into the profession from non-related education programmes but as a way of preparing them for entry into the teaching profession. Such provision of teacher education is underscored in an early UNESCO book authored by Sanyal (2013) on Quality assurance in teacher education in Africa. Specifically, the providers of most teacher education programmes are classified thus:

- The university system (e.g., faculties/institutes)
- The government, under different names (department of school education, department of public instruction, directorate of school education etc.)
- Independent colleges run by a specific agency
- Institutions run by different denominational agencies (e.g., religious organizations, community organizations, non-governmental organizations, minority groups etc.). (Sanyal, 2013, p. 17)

Added to the mix is a number of other developments listed as

- Privatization of non-instructional activities and provision of self-financed 'private' students in public institutions of teacher education.
- Establishment of private teacher education institutions with government support.
- Establishment of public teacher education institutions with private support.
- Self-financed private institutions of various types.
- Self-financed students in public institutions. (Sanyal, 2013, p.17)

In a study by Robinson and Taylor (2019), a detailed submission is made in the situation in sub-Saharan Africa, with many examples on in-country practices provided. While the focus is on preparing teachers for secondary schools, the submission is indeed very useful even for the primary school context. From the study, at least half of the 70 questions posed were fully answered in 16 countries, but the study undoubtedly offers a great insight into what happens in initial teacher education programmes in sub-Saharan Africa. For example, Robinson and Taylor (2019) note that students spend at least two years in their certificate programmes, and three in the diploma programmes while a total of four years is spent in degree programmes. It was however noted that often, the years of study will depend mostly on the prior qualifications and experience the students have, and even in some cases, recognition of prior learning (RPL) is applied as in the case of the Botswana Open University (BOU), which was not reflected in the study. In some cases, it was observed that countries with dire teacher training needs often create shorter programmes to address that demand (Robinson & Taylor, 2019). Admission is usually based on the possession of the General Certificate of Education, related ordinary level qualifications within national contexts, and examinations are required in some, with the example of the Joint Admissions and Matriculations Board (JAMB) examinations offered in Nigeria to enable normal admission to universities and colleges and polytechnics. Teaching is delivered mostly through a variety of methods including face to face teaching, and the use of open and distance learning strategies, or in some cases, other flexible part-time routes.

The assessment in many of the programmes, based on the work of Robinson and Taylor (2019) includes 'examinations, coursework, formative and summative lesson observations, essays, projects, and other presentations' (p.18). The example of Tanzania is shared where 'students are continuously assessed through exercises, tests, portfolios, seminar presentations, report writing and teaching practice (micro teaching, single lesson, and block teaching' (p. 18). The assessment in Zimbabwe, is carried out by staff

within the college where teaching practice is done. For Zambia, Uganda, Kenya and Botswana, the process is also clearly mapped out.

Many of the programmes are done within a 4-year period for post-secondary school programmes, in Southern, East and West Africa, and often students have one or two compulsory school subjects to add to their programmes. For those already with degree programmes in the humanities, sciences and social sciences, a one-year postgraduate programme in education is generally offered as the route to a teaching qualification. The stories are true of Botswana, South Africa and Nigeria. Most students use up to three months of teaching practice in all, and staff from the various institutions monitor and assess the students. Portfolios are additionally required in some contexts as a way of further determining what students' teaching practice sessions have been like.

Robinson and Taylor (2019) in their report note that research components are embedded in the programmes offered in Nigeria, Zambia and Mauritius. They further add that inductions for the new teachers are held in at least 23 of the countries studied. On licensure, 16 of the countries are said to have a formal process of teacher licensing and are spread across the west, east central and southern Africa. Botswana has just joined the regulatory process, and was involved in a recent conference organised by AFTRA in Angola and attended by this author. The event was aimed at enhancing the process. The licenses require fee payments, have continuing professional development points in some cases, and are generally renewable and penalties are outlined for defaulting teachers and schools, ranging from fines to terms of imprisonment or both.

In many of the countries studied in the research done of Robinson and Taylor (2019), and other colleagues (Robinson and Taylor (2019), continuing professional development is delivered for teachers and quite a number of such are funded by international agencies, including United States International Agency for International Development (USAID), the World Bank, the European Union and the UK Department for International Development (DFID). In some cases, CPD points are acquired in programmes of varying lengths and a number of these have been supported by the Commonwealth of Learning (COL).

Still on continuing professional development, Abati (2024) has submitted that CPD is vital for enabling the skills of teachers following initial training, and more so when initial teacher education has been faulty. That way, it serves as a remediating function and further removes obsolescence in knowledge. Indeed, one way of ensuring this is by building into initial teacher education relevant CPD elements through experience, and for this, the Coach programme of the World Bank finds a berth (Abati, 2024). The Coach programme has four elements to it, namely that it is tailored, practical, focused and ongoing. In addition, Coach requires the development of technical resources, provision of operational support, and the facilitation of stakeholder engagement. For this, the use of the Teaxch-Suite, an open resource availed by the Coach programme becomes vital, in which a one-to-one person approach is utilised, in place of a traditional model of CPD.

In addressing challenges faced in traditional CPD situations, the Coach programme has been utilised, six examples of such are shared, with two of them coming from three sub-Saharan African countries, Sierra Leone, Mozambique and Tanzania. In Sierra Leone, no national CPD programme existed then, training was done in an ad-hoc manner, and it was not informed consumer-oriented; in Mozambique, teachers lacked lesson facilitation skills; and in Tanzania, CPD was not only ad-hoc and intermittent as of 2020, at least over 80% of teachers had no CPD for five years (Abatti, 2024). Similar stories were

shared of India and Punjab, for which the Coach intervention programme proved a game changer in all the cases.

Intervention of Open and Distance Learning (ODL)

Early ODL involvement has been recorded in many teacher training and development initiatives across sub-Saharan Africa. Adekanmbi (2000) has written variously on this subject, noting its early use for teacher training programmes in many parts of sub-Saharan Africa. For example, the inception of Ahmadu Bello University Zaria in Nigeria into ODL in 1967 aimed at providing in-service teacher training, and the setting up of the National Teachers' Institute in Kaduna in the same country in 1976 was for the same reason while Correspondence and Open Training Institute (COSIT), established at the University of Lagos, in 1974, with a science education and business orientation. The University of Botswana initially through its Centre for Continuing Education run an upgrading programme for enhancing teacher competencies. Similar stories abound in UNISA in South Africa, the Open University of Tanzania, the National Open University of Nigeria and the Zimbabwe Open University. Most of the ten existing open universities in sub-Saharan Africa have teacher education and training programmes as a major part of their activities. The programmes reported in the research work by Robinson and Taylor (2019) reflect the activities of these institutions.

In the Commonwealth of Learning (COL) publication *'Open Universities in the Commonwealth at a Glance'*, it is noted that 2,745 programmes are run, and a total of 24,505 courses are taken, with a number of these being education programmes and for teacher training (Commonwealth of Learning, 2023). These include COL initiatives, recent developments, micro credentials, and OER. Various open and distance learning institutions participate in the promotion of teacher training and development in the sub-continent.

In an earlier publication, *'Teacher Education Through Open and Distance Learning'* (COL, 2010), Danaher and Umar (2010), make a case for ODL thus:

- ODL radical approach allows more teachers to be trained.
- ODL flexibility and use of information and communications technology help it to address many challenges of access and meet needs of many
- Where teachers are remotely located, OER can be used to upgrade unqualified teachers.

Elsewhere in the book, various examples of ODL use in teacher training are seen. Some earlier publications which laid the groundwork for COL's use of ODL for teacher training include the *'International Case studies of Teacher Education through Open and Distance Learning'*, edited by Bernadette Robinson and Colin Latchem (2003) and the *'International Case Studies of Teacher Education at a Distance'*, edited by Perraton, Robinson and Creed (2007) had been done. Also in 2002, *Teacher Education Guidelines: Using Open and Distance Learning – Technology, Curriculum, Cost, Evaluation* (UNESCO 2002) was published. This underscores the importance placed on promoting teacher education through ODL. In many countries, teacher education via ODL has been extensively promoted.

The Global Challenge in Teacher Preparation

In a report on the global challenge of teacher shortages, UNESCO (2024) focuses on quantity gaps, quality gaps, inadequate teacher-pupil ratio matters, teacher salary issues, inadequate working

conditions, temporary contracts, teacher migration and gender-related issues. These are serious issues considering the UN development goal number 4, which aims to achieve the following:

- Completion of free, equitable, and quality primary and secondary education for all girls and boys.
- Provision of access to affordable technical, vocational, and higher education.
- Provision of lifelong learning opportunities.
- Elimination of gender disparities in education and ensuring of equal access for marginalised groups.

According to UNESCO (2024), on numbers, while there were 4,931,000 teachers in primary education in sub-Saharan Africa in 2022, 2,447,000 were needed to be replaced, due to staff attrition, and 2,946,000 new teaching posts needed to be created, thus leading to a total of 4,391,000 teachers needed in the primary school setting alone. For secondary education, while 3,528,000 were available in the system in 2022, for attrition replacement alone is 3,191,000 needed and 7,467,000 required as new teaching posts. The total need for secondary school teachers is thus 10,658,000 to meet the SDG goal 4 by 2030 (UNESCO, 2024). Also, the total figure is 15,049,000 teachers needed in primary and secondary schools in sub-Saharan Africa to meet the SDG demand.

Table 1: Total number of primary and secondary school teachers needed in Africa by 2030

Region	Primary and Secondary Teachers in 2022	Teacher Recruitment Needed for 2030		
		Replacing staff attrition	New teaching posts	Total
North Africa and Western Asia	6,197,000	2,506,000	1,751,000	4,257,000
Sub-Saharan Africa	8,459,000	5,638,000	9,411,000	15,049,000
World total	73,133,000	25,442,000	18,521,000	43,961,000

Source: UNESCO (2024)

The specific countries that may meet the demand for primary education teachers are, Malawi, DRC, Gambia, Namibia, and Nigeria. For secondary school teachers, Kenya, CAR, DRC, Gambia and relisted among the SSA countries that are able to meet the demand (UNESCO, 2024).

On the quality of provisions, it has been noted that 84% of teachers globally are trained for secondary education in 2023. The figure for sub-Saharan Africa, in 2021 was 60%, while for OECD countries in 2022 was 86% for MENA countries, in 2023, it was 87% (World Bank, 2024d). For primary schools, the percentage globally was 85% in 2023, sub-Saharan Africa, 65% in 2022, MENA countries, 83% in 2023 and for OECD countries, 93% in 2023 (World Bank, 2024e). UNESCO (2024) however reports that 69% of primary school teachers in sub-Saharan Africa have the minimum qualifications, a decline from a percentage of 75% in 2010 with such reductions reflected in Rwanda, in 2022, down from 96% in 2014 (UNESCO, 2024).

The subject of professional development has been examined extensively by Mitchell et al (2024). who note the major role governments play in providing direction to and maintaining control of professional development activities. They set the rules and protocols and enact these policies to strengthen the teacher's workforce. National frameworks are established, often there is a sense of compulsion attached to their involvement, hours of practice are set, and they determine activity focus. In some

parts, points are earned towards re-licensing, something observed in Ghana and South Africa; and many use it to climb career ladders. Some of the topics explored include professional development, ICT use, curriculum change and policy reforms. So also, there are issues to do with the teaching of science, technology, engineering, and mathematics (STEM). Non-governmental organisations (NGO) and international agencies have also been actively involved, and these often have their own developmental thinking and agenda to pass across and enforce. Data set for the study were drawn from South Africa, Ghana, Ethiopia, Rwanda, Kenya, Malawi, Nigeria, Senegal, Uganda, and Zambia. The summary of the findings is that.

- The organisation of TPD [teacher professional development] tends to undermine, rather than strengthen, the situated professional knowledge and agency of teachers.
- Despite the emphasis given to Gender Equality and Social Inclusion as a focus of TPD initiatives, provision reproduces social inequalities. (Michelle et al, p.25)

The authors note the need to mobilise teachers' knowledge and agency, promote ongoing professional development activities and long for greater involvement in such as active stakeholders in issues related to what happens within their classrooms.

On the migration challenge, the World Migration Report, published by the International Organisation for Migration (2024) has detailed extensively the global challenge. Adekanmbi (2025) has examined some aspects of the migration challenge in the context of teacher education and development. Notably, he notes that teacher attrition in sub-Saharan Africa occurs through migration, citing a study by Ochs and Yonemura (2013). Many teachers are recruited from Africa by the global north. UNESCO (2024) adds that teacher migration occurs because of low salaries, teachers desire to choose new career paths, the need to move away from areas of conflict, a quest for professional autonomy, and a response to recruitment drives from the global north where the attractions of greater pay are seen and responded to by Africans.

UNESCO (2024) has written about the problem of overcrowded classrooms, a subject that has also caught the attention of Lawal (2019), of *The Guardian* newspaper. She had noted in an article, while describing a classroom setting in Nigeria:

Wearied eyes, their brows drip with sweat. The sweltering weather was worsening but they remained packed in a classroom that could hardly contain them waiting for the teacher to arrive. The noon sun worsened even more and by now the young scholars were wiping the sweat off their faces with the sleeves of their uniforms. By now, the collars of their uniforms have become blackened by the accumulation of sweat at the nape of their necks.... By the time the teacher entered the classroom, the students were already red-eyed, struggling to stay awake. In a couple of minutes, beads of sweat began to form on the brow of the teacher. He dabbed his face with a white handkerchief. He grabbed a book from the desk of pupil. He fanned himself momentarily.

MITIGATING THE CHALLENGES

One of the challenges faced in teacher shortage has been the migration of teachers. To address this challenge, the work of Education International (2014) '*Getting Teacher Migration and Mobility Right*' becomes useful. In the publication, Caravatti et al. (2014, p. 12) submit the following:

- Improve data collection and make it publicly available

- Protect migrant teachers' rights and support their professional needs.
- Increase opportunities for well-structured professional exchanges and language programmes.
- Reduce reliance on international recruitment to fill shortages or spur development. Involve educators and unions, especially in times of crisis.
- Limit and regulate the role of recruitment agencies and eliminate fees for teachers. Empower migrants through unions.

The establishment of the Commonwealth Teacher Recruitment Protocol (2024) was developed as a way of managing the migration of teachers, although it has not fully succeeded. Some of the challenges have included inadequate awareness of the process, non-clarity on who could benefit, poor advocacy and the problems with data gathering. To further address the migration challenge, there is the need to improve the working conditions of teachers as well as their salaries. While noting that there will always be mobility one way or the other, the goal is to manage this properly and ensure that teachers are not shortchanged, while the sub-continent is also not unduly affected. Writing on what he terms, poaching of teachers from Commonwealth countries, of which the United Kingdom is quite guilty, Mawhinney (2025) is of the view that the teacher shortage crisis in the Commonwealth itself can be tackled through commitment to the Commonwealth protocol, adopting Singapore principle where teachers earn around 50% more than other similarly qualified professionals and even have opportunities for enhanced career prospects. The challenges which the Commonwealth Teacher Recruitment Protocol (2024) faced include issues of poor data capturing, awareness lacking by data capturers, poor advocacy, and others related to standards harmonization should be addressed.

In a recent contributory chapter to a Festschrift in honour of Professor Kola Kazeem, Adekanmbi (2025), explored a number of options. They include the need to expand teacher education opportunities, expansion of the quality of offerings and the expansion of recruitment modalities as well as of the financial support for such training. Alluding to such issues where reduction is needed, Adekanmbi (2005) also noted the need to reduce gaps in teacher's pay, a possibility of budget decentralization, and the use of non-monetary benefits. Where inadequate pedagogies are found, such must be reduced while the promotion of all forms of self-directedness is encouraged within teacher education methodologies. Similarly, the health of teachers and their general wellbeing is also underscored.

The development of the Teacher Policy Development Guide by UNESCO was aimed at, among others, providing an understanding what policy development in teacher education entails, policy contextualization and alignment with education and other policies including useful checklist for the recruitment and retention of teachers, basic foundations and principles for teacher policy, and the use of existing tools to effectively analyze policy. Teacher education in the context of CPD is also explored, with deployment career path and growth, employment and work conditions and reward and remuneration, and teacher standards clearly articulated. Teacher accountability and school governance are finally explored. The document also has links to a wide range of links to schemas, regional and national documents, and policies, which serve as a platform for benchmarking ideas across the board.

Internationally, in addition to the developmental, advocacy and distance learning initiatives of the Commonwealth of Learning, the African Council for Distance Education (ACDE), the Distance Education Association of Southern Africa (DEASA), the GNDE is also actively pursuing major strides in enhancing

practice in teacher education globally and continentally. In August 2025, a symposium is being organised by the GNDE aimed solely at Future-Proofing Teachers: Global Perspectives on Integrating AI and Digital Tools in Teacher Preparation.

In the work of the ADEF, various activities aimed at enhancing practice are seen. In June 2025, the ADEF organised a symposium in Mauritius, where it was looking at the strategies embarked upon by various universities in Africa, and related institutions to reduce teacher shortage in the sub-continent. There were submissions from Mauritius, Nigeria, Ghana, Botswana and from the UNESCO Teacher task Force. Such opportunities need to be continually explored to mitigate the challenges faced and create further awareness among teachers.

Activities of Qualifications Networks and Regulatory Authorities

The on-going development and growth of qualifications networks has benefits for reducing teacher shortages. This is because such networks, at national, regional and continental levels help to ensure qualifications comparability, enable recognition of prior learning and skills, allow for cross-border opportunities for qualifications recognition and utilisation, and also allow for comparability of assessments across contexts (Adekanmbi, 2015). When qualifications in teacher education are obtained across borders, as alternative routes, National Qualifications Frameworks (NQF) help to promote growth and numbers, as well as quality of such qualifications through necessary accreditation processes.

Similarly, regulatory authorities have been seen in many parts of Sub-Saharan Africa. Looking at this from the perspective of the African Framework of Regulatory Authorities (AFTRA), the following have been observed. A visit to the AFTRA website reveals a range of numerous resources that speak to school leadership and licensure, African Framework of Standards and Competencies for the Teaching Profession, African Teacher Qualification Framework For Teacher Quality, Comparability and International Mobility, the African Union continental Guidelines, country and continental resources as well as general resources aimed at enhancing capacity development. While some of the resources are continent-based, some specific countries reports on regulations and standards, and others are international documents of UNESCO and related bodies. They offer an array of continuing professional development ethos and ways of enhancing practice.

Artificial intelligence and its usage portend a great development in modern times, although not without its negative and positive implications. For the purpose of this section of the paper, our attention is drawn mostly to its possibilities for expanding and enhancing teacher preparation and continuing professional development. In a submission by Kaniwa and Adekanmbi (2025), they outline the various possibilities of AI integration in enhancing university programmes, noting its ability to promote digital learning, and enhance teaching and assessment activities, among others. This obvious can be applied to teacher education growth and development in a variety of ways.

There are benefits which the use of micro-credentials, expansion of qualifications networks, and digitalization can do as possible mitigation strategies. In a report on micro credentials, published by the African Continental Qualifications Network (ACQF, 2023), micro credentials have been used as a way of making qualifications available to students in small chunks. The study which includes many countries in sub-Saharan Africa shows that in Ghana, Malawi, the Democratic Republic of Congo, Nigeria, Rwanda, Burkina Faso Zambia, Angola and Botswana, micro credentials are already being used. The core characters seen in micro credentials are generally (AQCQF, 2023) as follows:

- Referring to learning over a limited time period and/or in a specific area,
- May form part of or adding to formal qualifications,
- Potentially 'stackable' over time, adding to individual learning careers,
- Given their limited size and focus, more flexible than traditional qualifications,
- Based on assessed learning,
- Frequently delivered in a digital form.

The adoption and use of open educational resources will also help to address the issues of quantity, especially in utilizing the opportunities which OER offers. OER undoubtedly promotes the use of free and open educational resources for the benefits of those who face multiple problems of lack of educational materials, inaccessibility of the same and high costs of obtaining such resources. By their nature, open educational resources are 'teaching and learning resources in any medium, digital or otherwise, that permit no-cost access, use, reuse and repurposing by others with no or limited restrictions' (McGreal, 2016, p. 1). They are 'digitized materials offered freely and openly for educators, students and self-learners to use and reuse for teaching, learning and research' (OECD, 2007, p. 10). Their benefits, as identified by OER Africa include their affordability, their ability to increase access, the removal of barriers to resources, and the flexibility they offer regarding use especially in open and distance learning contexts, which they fully support. Teachers can benefit a lot from OER use and it is recommended that OER be an integral part of any teacher education and development processes as a way of addressing teacher shortage. In a report published by Teacher Education in Sub-Saharan Africa (TESSA) titled '*Case Studies on African OER Initiatives in Higher Education*', the opportunities for enhancing teacher development are further highlighted through the use of OER initiatives.

In a major work edited by Sibanda, Tonda and Dudu (2022) the editors and other authors explored the pre, post and various dimensions of teacher training experiences in Africa and noted principally the need to reform teacher training programmes on the continent, as a way of addressing inequities, which are driven by poverty, noting that the lethargy of African governments in transforming higher education must be addressed. Although the context of many of the chapters in the book is higher education, the core message is that those who provide teacher training must reflect on the existing practices and pursue inclusivity rather than exclusivity in addressing numerous observed challenges. Core issues focused on include utilizing technologies appropriately in education and training, the need to create a new generation of educators who are tech-savvy, the need to pursue self-direction in teaching strategies, recalibrate education sites, and pedagogically empower teacher trainees. And explore alternative assessment modes. In addition to the above, it is recommended that for higher educational institutions that produce teachers, a clear link be made between the teachers' world of work and the institutions providing teacher training.

In an earlier submission by Sanyal (2013), the author addressed one of the three core issues UNESCO cares about regarding teacher education and training. The three issues had been flagged by Nhavoto (2013) in a foreword to the book itself, namely, quality assurance of teacher education, measurement of teachers' performance and their professional development' (p. 5). Beyond the notion of initial education and training, a clear reminder is made about the need to ensure induction, through training and support, and pursue continuing professional development (CPD) and shared understanding about the link between providing good quality education and enhancing socio-economic development. A major rationale is the growing need for more teachers,

While the growth and promotion of professional learning communities has been highlighted in the literature, it becomes vital that a full use and pursuit of professional learning communities' development, with teacher active agency seen in such is also very helpful. Teachers must own the activities that further their growth and departure from obsolescence, they must pursue, prioritize and pontificate on the challenges that affect their professional work and classroom practices. Michelle et al (2024) in their detailed study, further underscore this. They clear note that teachers must be partakers in their own professional growth, for ownership, relevance, contextualization, and sustainability of practice.

The pursuit of international collaboration and partnership is another way of mitigating the challenges. Current activities of AFTRA in its support and participation in the work of regulatory agencies across sub-Saharan Africa are aimed at promoting quality of operations, ensuring institutional benchmarking, enhancing training, promoting partnership with governments and other notable bodies and parastatals, working with unions and universities, and monitoring developments within UN agencies and providing avenues for reporting on new research and data thrusts, and understanding trends in teacher development and progress. At a recent roundtable and conference held in Lubango, Angola, from 5-10 May 2025, in the communiques issued by AFTRA, copious reference is made the communique of the ministers of education present at the end of the conference. Captured and slightly adapted from the final communique issued by AFTRA, there is a call for various agencies to (AFTRA, 2025, pp. 4-5)

The issues include the need to support the implementation of Continental Education Strategy for Africa 2026-2035 (CESA 26-35) regionally and continentally; support the teacher development clusters to enhance their participation; implement career related competencies for teachers through the use of the African Union frameworks; revise the teacher training curriculum and thus improve teacher qualifications and service conditions; and implement national teaching standards in line with the African Union mandate. Similarly, the communique (AFTRA, 2025) requests education ministries and related national agencies to strengthen their AFTRA membership as a way of promoting continental collaboration and exchange to enhance the professionalization of teaching. Also raise is the issue of increased political and material support to regulatory authorities, while the authorities themselves must engage in mutual support from one another. An expectation of increased salaries was raised while the prioritization of teacher development and the aligning of qualifications frameworks with the African Union (2019) Continental Teacher Qualification Framework also came up. Added to this is the provision of an environment that enables teachers to enhance their qualifications. Similarly, the need to implement the African Union (2025) Strategy on Mental Health and Psychosocial Support for Teachers was highlighted, so is the need to increase funding to education up to 20% of national budgets or 6% of national GDP in line with international standards. In addition to a call for teachers to receive mentoring support, and professional learning communities to be promoted, the communique also advocated for teachers to be part of policy making and implementation processes, feeding programmes should be introduced in schools without such, while for students with disabilities, programmes should be piloted or expanded nationally to meet their variety of needs. (AFTRA, 2025).

Also recommended in the communique is the harmonization of teacher training curricula, qualifications frameworks, and teaching standards to ensure the free movement of teachers as professionals across international borders, in line with the African Union (2018) Free Trade Agreement and the African Union Teacher Mobility Protocol. This will allow easy movement of teachers from

countries of surpluses to countries with shortages. AFTRA is expected to also take leadership of this process. On technology, there is a call for the integration of 21st Century digital education skills in teacher education curricula and expansion of opportunities for TPD through strategic investment in ODL and digitalization.

CONCLUSION

Without doubt, addressing the teacher shortage in sub-Saharan Africa requires a multi-pronged approach to tackling the problem, which undoubtedly poses great challenges to meeting of the United Nations Sustainable Development Goal 4 which, among others, aim to promote access to quality education. The huge number of teachers, 15 million in sub-Saharan Africa, to meet the SDG goal is massive and obviously would require every effort to address them. Through finding appropriate mitigation to the migration challenge, utilizing the resources and opportunities offered by regulatory authorities, and utilizing opportunity of national and international collaboration, it is hoped that the challenges can be addressed. To this end, the continuing use of the support of the Commonwealth of Learning, the African Federation of Teaching Regulatory Authorities (AFTRA), national, sub-regional and international qualifications networks and the participation of the regional associations and bodies like the DEASA, the ICDE and the African Council for Distance Education should help matters. Beyond quantity, the quality of provision is also key, with the regulatory frameworks providing the much-needed support and clout.

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A blended teacher education model for open and distance learning universities in low- and middle-income countries achieving Sustainable Development Goal 4

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ABSTRACT

Low- and middle-income countries (LMICs) are facing challenges in providing equitable access to teacher education programmes for teachers from disadvantaged regions, especially female teachers in rural areas, creating barriers to achieving Sustainable Development Goal 4 Quality Education (SDG4) by 2030. Flexible models of Blended Teacher Education (BTE) could potentially address this challenge, as few such models currently exist, and policy documents on the issue tend to lack specific strategies. The study reported in this paper developed a BTE model based on the Complex Adaptive Blended Learning System (CABLES) and Community of Inquiry (CoI) frameworks in Bangladesh. Arising from a review of ten existing BTE models, an empirical study including document analysis, a cross-sectional survey, and semi-structured interviews were conducted at Bangladesh Open University. 366 teacher trainees, three teacher educators, and one policymaker participated. Based on the findings, a BTE model, suitable for open and distance learning modes of teacher education in Bangladesh was developed. By developing the model, this study's original contribution to knowledge derives from its aim to identify design principles that are inclusive, equitable, and enable lifelong learning to support the achievement of SDG4, which may be valuable to other LMICs.

Keywords

Bangladesh; blended learning; blended teacher education model; open and distance learning; SDG4

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1. INTRODUCTION

Blended teacher education (BTE) has been conceptualised as an amalgamation of face-to-face and online learning that could address quality education issues. After COVID-19, BTEs are becoming more commonly used worldwide, including in low-and-middle income countries (LMICs). However, a BTE model that can support the achievement of SDG4 for LMICs is still uncommon, although there are several studies related to BTE, mainly in High-Income Countries (Perry et al., 2021). While BTE models have been designed, research on decolonisation and educational technology suggests that these models do not always apply in LMICs, and this approach risks imposing models from the outside that do not fit with local needs, and sometimes, low-tech contexts (Perry et al., 2021).

To contribute to achieving SDG4, a model will need to demonstrate how it can increase the supply of qualified teachers and promote inclusive and lifelong education (Tatto, 2021). Little research has explored how BTE can accomplish SDG4 in LMICs like Bangladesh. This study aims to contribute to this gap by developing a new model for Bangladesh. The conceptual framework of the model will be based on the Complex Adaptive Blended Learning System (CABLES) (Wang et al., 2015) and Community of Inquiry (CoI) frameworks (Garrison et al., 2000).

1.1 The Current Teacher Education System In Bangladesh

Depending on the educational level, several compulsory teacher education programmes are recommended by the Government. As per the report from the Bangladesh Education Statistics (2022), an overview of compulsory teacher education programmes and the educational structure of Bangladesh is given in Table 1. Primary Teacher Training Institutes (PTI) provide a 10-month basic training for primary teachers. This in-service training was started in January 2024; previously, this training was one and a half years long and named Diploma in Primary Education. On the other hand, Teacher's Training Colleges (TTC) of the National University, Bangladesh Open University, Jagannath University, and three private universities (Asian University of Bangladesh, Royal University of Dhaka, and World University of Bangladesh) run a one-year initial teacher education programme named Bachelor of Education (B.Ed.) for secondary-level school teachers. This is the main initial teacher education programme in Bangladesh for the secondary level.

Table 1. Education level and compulsory teacher education system in Bangladesh

level of education	name of teacher education programmes	types	providing institutions
Primary	10-month duration Basic training for primary teachers (Revised Diploma in Primary Education)	In-service	Primary Teacher Training Institute (PTI)
Junior Secondary & Secondary	One-year duration Bachelor of Education (B.Ed.)	Pre-service and in-service	Teacher's Training Colleges (TTC) of National University, Bangladesh Open University, Jagannath University, Asian University of Bangladesh, Royal University of Dhaka, and World University of Bangladesh

Higher Secondary	No teacher education programme is compulsory.		
Tertiary	No teacher education programme is compulsory.		

Source: Author's creation (2022)

1.2 The One-Year Bachelor of Education (B.Ed.) Programme

According to the Bangladesh Education Statistics (2022), the one-year Bachelor of Education (B.Ed.) programme is the compulsory initial teacher education programme for junior secondary and secondary level school teachers in Bangladesh. It has been designed for both pre-service and in-service teacher trainees. Three public universities - the National University, Bangladesh Open University (BOU), and Jagannath University (JnU) - conduct this programme. National University (NU) has 37 Teachers' Training Colleges (TTCs) (20 Public, 17 Private), and Bangladesh Open University (BOU) has 28 study centres. These two universities conduct the B.Ed. programme with academic collaboration, BOU used NU's TTCs as their study centres. The B.Ed. curriculum of these two universities is also the same. On the other hand, Jagannath University and the other three private universities - Asian University of Bangladesh, Royal University of Dhaka, and World University of Bangladesh - conduct B.Ed. at their campus with individual curricula (Bangladesh Education Statistics, 2022). Pillay et al. (2017) explored that due to contextual factors such as learning environment, infrastructure, and existing teacher education provisions, all universities have incorporated the conventional face-to-face method, notwithstanding their differences.

1.3 One-Year B.Ed. Programme At Bangladesh Open University

Bangladesh Open University is the only open and distance learning public university in Bangladesh. It has been conducting the B.Ed. programme since its founding in 1992. Beginning with the 2020 academic year, BOU adapted the NU B.Ed. curriculum and has been conducting the programme in collaboration with NU under a memorandum of understanding. However, BOU offers this programme through open and distance learning (ODL) mode, with 28 study centres nationwide. The in-person face-to-face sessions are being conducted on weekend days. Hence, teacher trainees are not required to take one year of study leave from the authority to enroll in this B.Ed. programme. Every year, about 10,000 trainees are admitted into B.Ed. programme because of the flexible provisions and ODL method (Bangladesh Open University, n.b.). Although BOU aspires to become a digital university, it is required to adopt a conventional face-to-face ODL design for its B.Ed. programme due to the educational settings. Nonetheless, it is progressively implementing the ICT-integrated digital ODL system on its own and the country's declaration of digitalisation. For instance, in addition to traditional printed modules, teacher trainees now receive pre-recorded audio-visual lectures and e-book formatted modules as learning resources via the BOU website (Bangladesh Open University, n.d.). Additionally, learners receive weekly in-person face-to-face teaching along with a few online sessions conducted using Zoom software. Nevertheless, as these are not included in the curriculum, it is entirely up to the teacher educators' preferences. However, assessment processes are still entirely traditional. For instance, Ahmed et al. (2022) explored that each trainee must complete handwritten assignments for each course traditionally and appear for an ordinary three-hour written test using pen and paper after each semester. Additionally, teacher trainees have to complete in-person practical tests for courses linked to teaching practice and ICT, as well as attend a face-to-face viva voce. In the second semester, Ahmed

et al. (2022) also found that although teacher trainees must complete an action research course, they submit it manually, which limits the opportunity to check for plagiarism. Therefore, by employing both conventional and some ICT-integrated digital ODL methods, BOU is gradually trying to balance the teacher trainees' contextual background and the Government's commitment to digitalisation.

According to the Bangladesh Open University (n.b.), the B.Ed. programme had a total enrolment of 5,018 in 2025. Thus, BOU B.Ed. programme is one of the largest B.Ed. programmes in Bangladesh. It represents a significantly higher portion of teacher trainees, teacher educators, and policymakers in Bangladesh. In addition, since this is a public university, the dean, director, principals, and senior teacher educators work as policymakers in Bangladesh. However, despite being one of the most extensive B.Ed. programme-conducting universities in Bangladesh, limited research has been conducted at the BOU, focusing on B.Ed. programme. Particularly, in the area of blended learning and the targets of SDG4. Hence, a blended teacher education model, suitable for open and distance learning modes of teacher education, which can contribute to the achievement of SDG4 in Bangladesh, is still uncommon. To address this gap, this study was conducted at BOU. Additionally, since BOU is one of the largest B.Ed. programme conducting universities in Bangladesh, the findings will represent the population and the proposed sustainable blended teacher education model; therefore, it seeks to be generalised for Bangladesh.

1.4 Research Questions

The main aim of this study is to develop a sustainable blended teacher education model for Bangladesh suitable for open and distance learning modes. Hence, it is imperative to initially examine the current teacher education models used in Bangladesh in terms of blended learning and targets of SDG4, i.e., inclusive, equitable, quality, and lifelong teacher education. In addition, it is vital to investigate and assess the important factors for establishing a sustainable model of blended teacher education in Bangladesh. Therefore, this study intends to address the following research questions:

1. How effective is the Bangladesh Open University (BOU) B.Ed. programme in terms of blended learning principles?
2. How do current B.Ed. programme of Bangladesh Open University (BOU) align with the targets of SDG4, i.e., inclusive, equitable, quality, and lifelong teacher education?
3. What factors are important in developing a sustainable model of blended teacher education in Bangladesh?

1.5 Significance and Originality Of The Study

The Bangladesh Government is trying to achieve SDG4, namely, inclusive, equitable, and lifelong education for all by 2030 (Sustainable Development Report, 2023). They also attempt to digitalise secondary-level initial teacher education (Hansson et al., 2018). There is a gap in current research that explores how the current delivery of initial teacher education aligns with SDG4 targets and how a model of blended teacher education can support Bangladesh in attaining SDG4. Studies by Chowdhury (2013), Khan (2014), Hasan and Khan (2013), and Hasan, Khan and Clement, (2015) were concerned with suggestions regarding integrating technologies in teacher education in Bangladesh only. Ahmed et al., (2022), in contrast, proposed a blended learning model. However, this model did not include any measures for achieving SDG4, i.e., inclusive, equitable, quality, and lifelong teacher education.

The secondary level teacher education programme of Bangladesh, i.e., B.Ed. programmes have traditionally adopted a face-to-face approach that covers every subject area and are designed for both pre- and in-service trainees. However, Cross et al. (2022) and Pillay et al. (2017) argued that they are struggling to provide quality teacher education regarding inclusivity, equity, and lifelong learning. The challenges they face are geographical e.g., all of the B.Ed. providers are in urban areas, while 67.12% of teachers live in rural areas (Bangladesh Education Statistics, 2022); socioeconomic e.g., they are expensive (Parvin, 2017); lack of inclusivity e.g., there is no policy for trainees who are disabled; and tend to be short-term and not lifelong e.g., there is limited access to continuing professional development across a teacher's career (Ahmed et al., 2022). Thus, by developing a sustainable blended teacher education model for Bangladesh, this study's original contribution to knowledge derives from its aim to identify design principles that are inclusive, equitable, and enable lifelong learning to support the achievement of SDG4.

2. DIFFERENT MODELS OF BLENDED TEACHER EDUCATION

An essential step of developing a blended teacher education model is carefully analysing current models. Several studies thoroughly evaluate these models. For instance, an early model of blended teacher education was found in Robertson's study (2008). This model was for vocational teacher trainees in Australia and consisted of eight weeks of in-person lessons conducted through in-person face-to-face interaction, followed by an assessment process. Following the assessment, there will be five weeks of group learning activities. This will include a one-week tutorial focused on the wiki—an internet-based platform for managing, generating, and editing content—and four weeks of in-person learning activities. Participants must also submit their completed tasks to the wiki during this time. The model did not include online tutorials but attempted to include a technology, specifically a wiki, into the training course. This model focused more on the in-person tutorials than many subsequent blended models. Nevertheless, this model might be regarded as a prototype for utilising technology to facilitate in-person interaction rather than for instructional purposes.

Owston et al. (2008) presented a comprehensive analysis of three blended teacher education models utilized in Canada, namely the Advanced Broadband Enabled Learning (ABEL) program, Learning Connections (LC) project, and the Teacher e-Learning (TeL) project. The ABEL model was designed with the combination of an online learning platform, video conferencing with experts, and, lastly, a five-day in-person face-to-face activities at a summer institute. The model focused on providing informal training facilities to the teachers via online resources and video conferencing. The LC model was also similar to the ABEL model; however, it was more formal because it included online discussion activities, and teachers were required to submit a report on the online platform. Conversely, the TeL model was more structured than the ABEL and LC models. The TeL model consisted of one day of in-person tutorials, including group discussion and face-to-face interaction, followed by eight weeks of online learning activities, including group discussions, online reading activities, and maintaining an online reflective journal. In evaluating these three models, Owston et al. (2008) argued that the high-structure model produced challenges for teachers to complete the course. In contrast, the low-structure model suffered from a lack of online engagement. Therefore, they recommended meticulously maintaining balance throughout the structure. The effectiveness of in-person face-to-face activities at the summer institute, which took place after the courses, was greater than that of both face-to-face and online activities during the courses. Most importantly, Owston et al. (2008) claimed that although the models were intended to develop a teachers' professional learning

community, this sense of community existed during the course time only and failed to develop a sustainable professional learning community for the teachers.

In the context of Turkish pre-service teachers, Caner (2010) described a model teaching practice course that utilised blended learning course which had a duration of fourteen weeks. This course's unique feature was that it allowed the teacher trainees to upload their lesson plans and teaching practice videos on a university-based online platform. This platform had an online discussion forum that facilitated the exchange of feedback on the uploaded lesson plans and videos, hence promoting peer learning opportunities. According to Caner (2010), the model offered various advantages such as interactivity, peer learning, and community building. However, the model did not adequately define the fundamental aspect of blended learning, which combines online and in-person face-to-face instructional design. Furthermore, the model was designed specifically for a single course, rather than an entire teacher education programme, limiting its applicability to other contexts.

Singapore's National Institute of Education (NIE) utilised two blended teacher education models (Cheung & Hew, 2011). The social constructivism theory of Vygotsky (1978) was the theoretical underpinning of both models. The first model comprised both synchronous and asynchronous learning (Figure 2.1). To facilitate synchronous learning, in-person face-to-face learning activities were employed, while asynchronous learning was supported through one online discussion activity. The model operated for 12 weeks, during which a two-hour in-person teaching session was held each week. The GNOSIS framework of Hung et al. (1998) was adopted to design this model's instructional mode and activities, i.e., to construct knowledge and interactions. Learners were given seed ideas, strategies, and skills for using technologies in the in-person face-to-face sessions. As a result, learners could actively participate in the online discussion session.

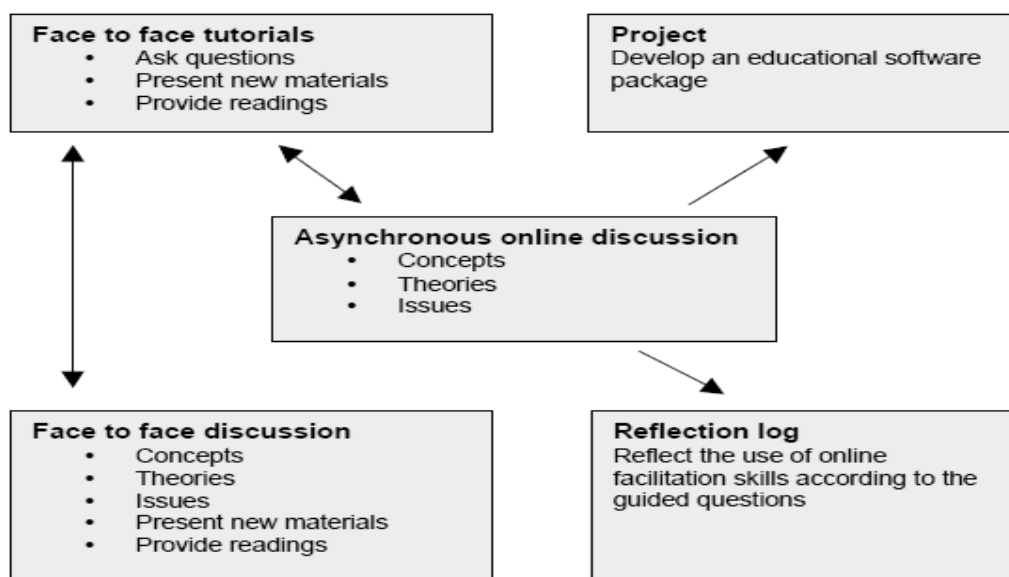


Figure 2.1: Blended Teacher Education Model 1 (Cheung & Hew, 2011, p. 1323)

On the other hand, the second model utilised two online discussion sessions with in-person face-to-face sessions (Figure 2.2). This model adopted the revised Bloom's Taxonomy for designing instructional approaches (Anderson & Krathwohl, 2001). Thereby, the in-person face-to-face sessions and the two online discussion sessions were implemented in terms of the revised Bloom's Taxonomy

principles, i.e., remembering, understanding, applying, analysing, evaluating, and creating. The teacher trainees received the initial in-person session, followed by the first online discussion activity and assessment tasks. Subsequently, they received another in-person session, followed by a second online discussion activity and assessment tasks. Cheung and Hew (2011) found that both models enhanced learners' online learning skills. However, these models used text-based educational resources for asynchronous learning, which limited its effectiveness as indicated by Lidyasari et al. (2023), which found that the application of multimedia-based educational resources increased the effectiveness of teacher education.

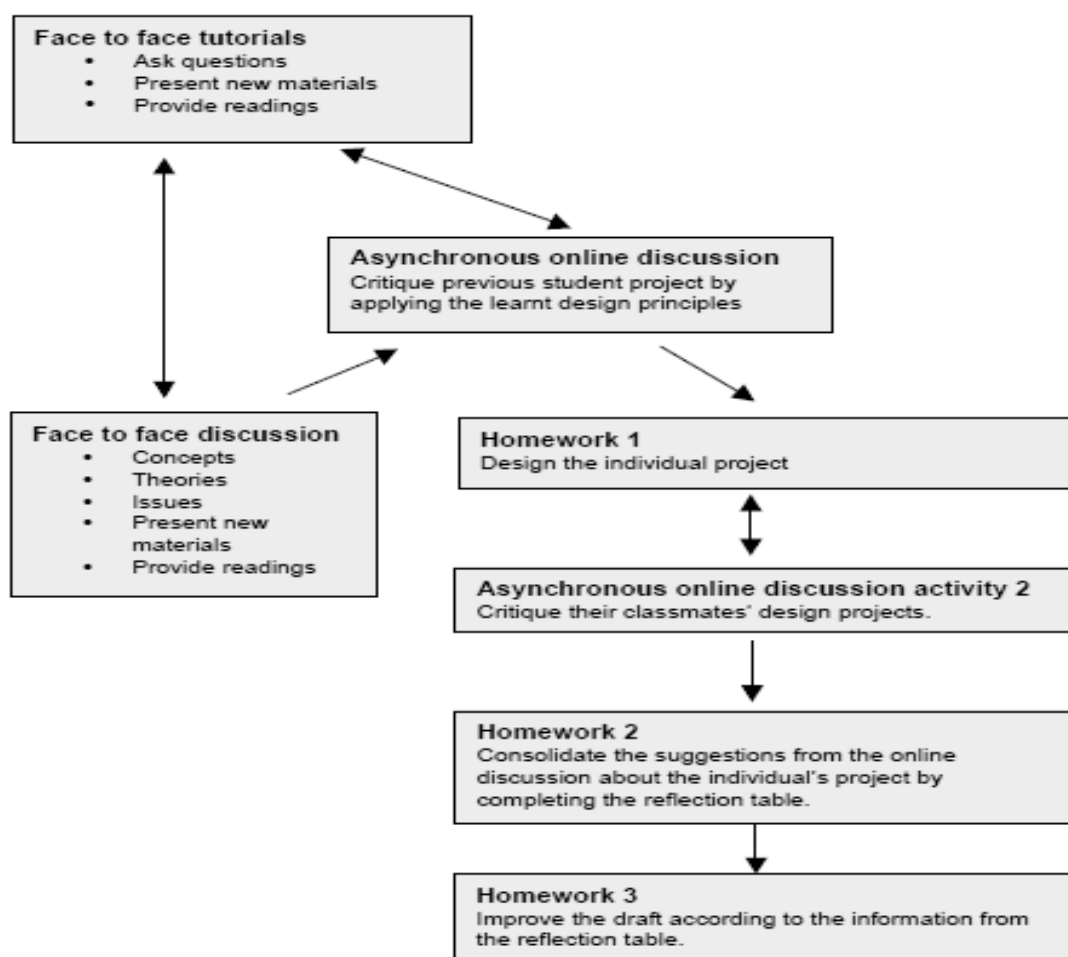


Figure 2.2: Blended Teacher Education Model 2 (Cheung & Hew, 2011, p. 1327)

One of Vietnam's teacher education programmes used the Teacher Professional Development Model (V-TPD) to develop a blended approach. In a quasi-experimental study, Ho et al. (2016) compared the effectiveness of this blended teacher education model to a conventional teacher education programme in Vietnam. The model consisted of six stages, the initial three stages focusing on development and the subsequent three stages focusing on execution (Figure 2.3). During the developmental phase, the objectives of the teacher education programme were to be formulated and thereafter conveyed via an online platform. During the execution stages, learners first participate in online discussions and peer learning activities. Subsequently, they were required to participate in in-person face-to-face sessions, followed by online assessment tasks for evaluation. Significantly, V-TPD offered a continuous learning opportunity that allowed teacher trainees to interact with the professional community and gain more knowledge even after finishing the course, thereby promoting

continuous professional development. However, in terms of self-efficacy, this model proved less efficient than the conventional model. Therefore, Ho et al. (2016) concluded that an instructional approach involving direct interaction and physical presence is more likely to yield superior results for acquiring practical skills.

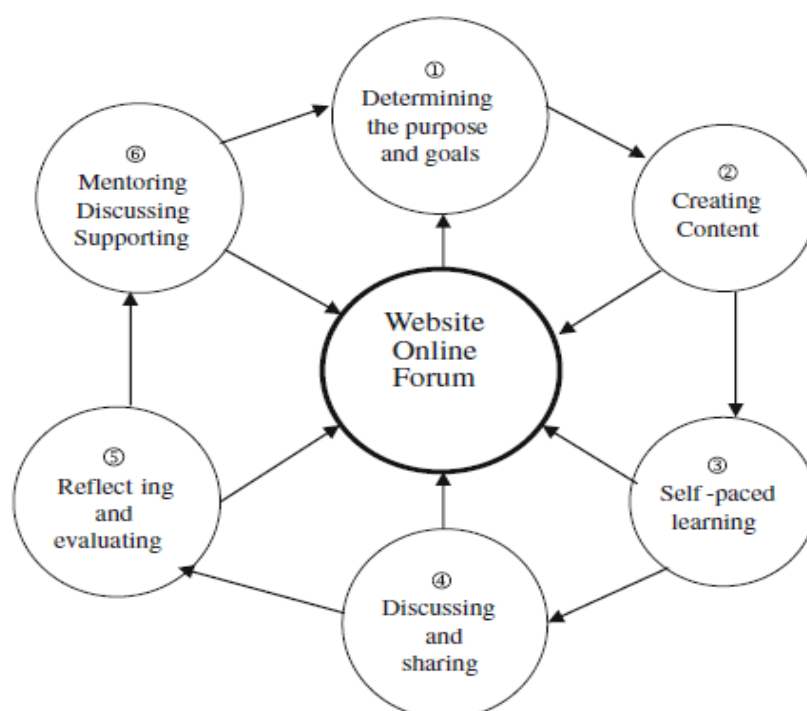


Figure 2.3: Teacher Professional Development (V-TPD) model (Ho et al., 2016, p. 188)

Papanikolaou et al. (2017) conducted an experiment in which they implemented a new blended teacher education model in the pre-service teacher education programme at the University of Athens, Greece. The model was developed using the Technological, Pedagogical, and Content Knowledge (TPACK) and Community of Inquiry (CoI) frameworks. This model aimed to enhance social learning opportunities through collaborative activities and the model consisted of a technology-integrated face-to-face workshop, which was followed by individual activities in an online environment. Finally, engaging in collaborative face-to-face and online discussions in groups. This structure lacked online participation. Hence, to enhance engagement in the online discussion, Papanikolaou et al. (2017) conducted another round of the study, modifying the design by incorporating a moderator in online group discussions. They concluded that incorporating a moderator in online group discussions increased the effectiveness of this approach.

The above analysis of the above-mentioned studies reveals that most blended teacher education models are being developed and utilised in developed countries. Few models are documented within the context of developing countries and low-and middle-income countries. Moreover, a blended teacher education model that can support the achievement of UN Sustainable Development Goal 4 (SDG4) for low-and middle-income countries is still uncommon. Little research has been conducted to address this issue. This study will address this gap by developing a sustainable blended teacher education model in the context of Bangladesh.

3. THEORETICAL UNDERPINNING OF THE STUDY

3.1. The Complex Adaptive Blended Learning Systems (CABLS) Framework

Cleveland-Innes and Wilton (2018), Khan (2022), and Olivera (2023) argued that to examine blended learning practices comprehensively in a programme as well as to design and implement blended learning in a programme, the Complex Adaptive Blended Learning Systems (CABLS) framework serves as an effective lens. Wang et al. (2015) developed this framework grounded on the complex system theory, a commonly used theory to comprehend the complexity of dynamic and non-linear systems of neural systems, ecological systems, and also social systems (Waldrop, 1992). Wang et al. (2015) mentioned that the CABLS framework aims to enhance comprehension of the dynamic and adaptable characteristics of blended learning. They explained that this framework considers blended learning as a system containing six necessary subsystems, and all the subsystems are interconnected and mutually influence each other. Figure 3.4 shows the CABLS framework. The six subsystems consist of the learner, teacher, technology, content, learning support, and institution. Wang et al. (2015) mentioned that although the learner is at the centre of the model, like any complex system, all subsystems are interconnected and mutually influence each other in a dynamic and non-linear manner. Simultaneously, each subsystem possesses individual attributes and internal influencing actors, which are contingent upon neighbouring subsystems, to sustain its survival. Additionally, every subsystem has its own subsystems, and all affect each other to form a blended learning system.

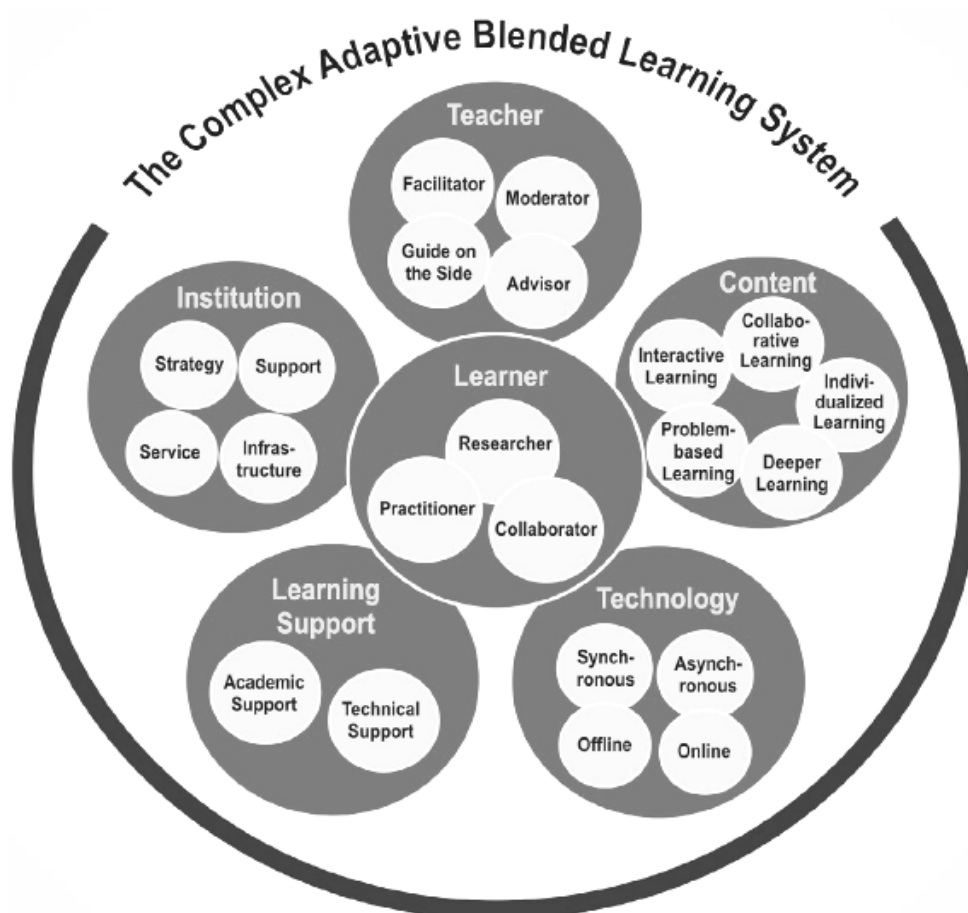


Figure 3.1: The Framework of Complex Adaptive Blended Learning Systems (CABLS), (Wang & Yang, 2015, p. 383)

Cleveland-Innes and Wilton (2018) argued that the CABLS framework is a comprehensive approach that enables the analysis of the key elements of blended learning. The framework enables individuals who are new to blended learning to carefully examine the essential interconnected elements involved in the development and implementation of a blended learning programme. Thus, since this study is related to (a) examining blended learning practices in the teacher education programme of Bangladesh and (b) developing a sustainable blended teacher education model for Bangladesh i.e., the six subsystems of CABLS need to be considered, this study incorporates the CABLS framework of blended learning as one of its theoretical underpinnings.

3.2. The Community of Inquiry (Col) Framework

Cleveland-Innes and Wilton (2018) argued that the Community of Inquiry (Col) framework is an essential framework for describing and designing an effective blended learning environment. Clague et al. (2023) found that to develop a successful blended learning environment, this framework has undergone validation in multiple studies since it was first introduced. The Col framework was introduced and developed by Garrison et al. (1999) and Garrison et al. (2010). They developed this framework based on the principles of an inquiry-based instructional approach (Cleveland-Innes & Wilton, 2018). Garrison et al. (2010) argued that three presences—cognitive, social, and teaching—are vital for online and blended learning environments. This study incorporates the Col framework as one of its theoretical underpinnings (Figure 3.2).

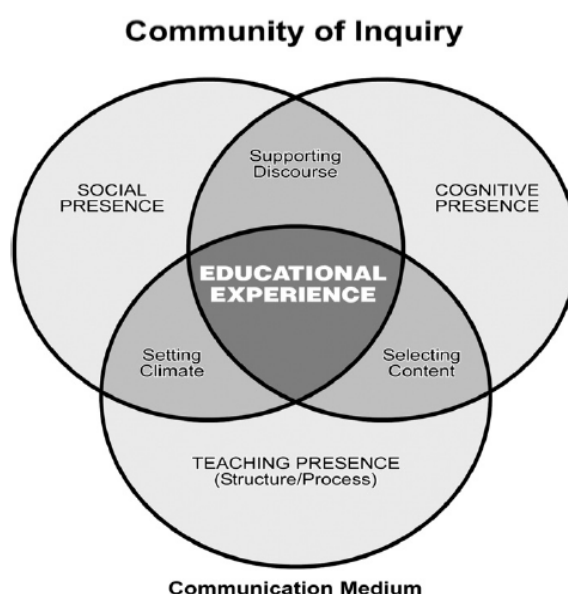


Figure 3.2: The Community of Inquiry (Col) framework (Garrison et al., 2010, p. 6)

4. METHODOLOGY

Following the pragmatism paradigm, this study employed a mixed-methods approach using a convergent parallel design. According to Creswell (2012), the convergent parallel design gives equal importance to both data types, quantitative and qualitative, collects two kinds of data simultaneously, and provides opportunities to compare the findings of both types of data analysis. Figure 4.1 presents the convergent parallel design of this study. The instruments, e.g., survey questionnaires and checklists of document analysis, and semi-structured interviews, were developed as per the literature review findings. Next, samples for the questionnaire survey were determined, and qualitative and quantitative

data were collected simultaneously. 366 teacher trainees of Bangladesh Open University (BOU) were selected by simple random sampling, while three teacher educators and one policymaker were purposively sampled for interviews. In 2025, teacher trainees of BOU were 5,018 (Bangladesh Open University, n.d.). Samples were constituted from these populations. Thereby, 366 teacher trainees participated, which meets the sampling guidelines of Krejcie and Morgan (1970), i.e., if the population is 6,000, then the sample size should be 361. Participation in this study was entirely voluntary, and participants had the right to withdraw from the study at any time. The obtained data were analysed via SPSS. Next, the findings of both data analyses were compared and explained.

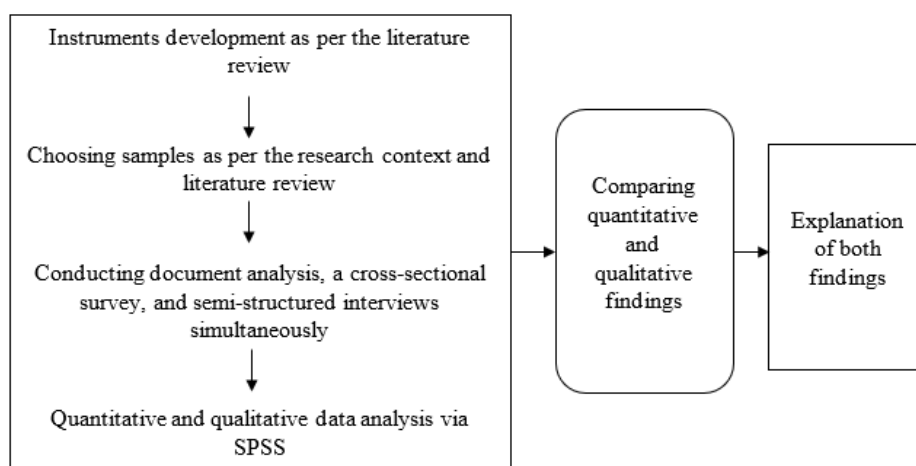


Figure 4.1: The convergent parallel research design of the study
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5. FINDINGS

Among the 366 teacher trainees, 65.6% (240) were male, and 34.4% (126) were female. Most of the teacher trainees (65%) were in the 31-40 age group. 81% had a Master's degree, and 80% were from rural areas. Most of them (90%) worked in private schools.

5.1. Validity, Reliability, and Normality of the Instruments

The results of the Skewness and Kurtosis tests show that items used in the questionnaire were normally distributed, as recommended by Kline (2005); the accepted scores of skewness and kurtosis are <3 and <10 respectively. Additionally, Cronbach's Alpha scores of all items are greater than 0.784, indicating acceptable internal consistency as per the guidelines of George & Mallery (2019). Therefore, all items were deemed to be reliable.

Table 5.1. Normality and reliability test

Items	Skewness	Kurtosis	Cronbach's alpha	No. of Items
The effectiveness of B.Ed. programme in terms of blended learning principles	.542	-.381	0.831	8
The alignment of B.Ed. programme with the target of SDG4	.725	2.594	0.842	16
Factors for developing a blended teacher education model in Bangladesh	.128	8.295	0.785	10

5.2. Effectiveness of the BOU B.Ed. Programme In Terms of Blended Learning Principles

Teacher trainees were asked to evaluate the effectiveness of the BOU B.Ed. programme in terms of blended learning by 8 Likert scale items that contained options 1 (Not at all) to 5 (Fully). The results showed that most of the teacher trainees mentioned that BOU partially utilised blended learning in its B.Ed. programme, overall mean score 2.6376. The highest number of teacher trainees (69.1%) mentioned that BOU partially utilised blended learning. 42.9% mentioned that the assessment of this B.Ed. programme “Not at all” appropriate for blended learning approaches. Table 5.2 presents the detailed results of each item.

Table 5.2. Effectiveness of the BOU B.Ed programme in terms of blended learning principles

Items	not at all (%)	partially (%)	unsure (%)	adequately (%)	fully (%)	mean
1. To what extent is your university utilising blended learning approaches in this B.Ed. programme?	13.9	69.1	0.0	9.0	7.9	2.2787
2. In this B.Ed. programme, to what extent does your university implement pedagogical strategies that are suitable for blended learning?	15.0	63.1	0.3	10.1	11.5	2.3989
3. To what extent does your university provide the technological support suitable for blended learning approaches in this B.Ed. programme?	15.3	43.2	5.7	21.0	14.8	2.7678
4. To what extent is the instructional design of this B.Ed. programme suited for blended learning approaches?	11.5	32.8	4.1	24.0	27.6	3.2350
5. To what degree is the content of this B.Ed. programme appropriate for blended learning approaches?	16.9	42.3	4.9	18.9	16.9	2.7650
6. To what extent is the assessment of this B.Ed. programme appropriate for blended learning approaches?	42.9	22.7	5.5	17.5	11.5	2.3197
7. To what extent is the infrastructure of your university suitable for blended learning approaches in this B.Ed. programme?	23.2	43.2	4.1	14.5	15.0	2.5492
8. To what extent are the ethical procedures of your university suitable for blended learning approaches in this B.Ed. programme?	26.5	28.4	7.4	15.3	22.4	2.7869
Overall mean					2.6376	

Interview data explored similar findings. For example, considering the delivery mode of this B.Ed. programme, one teacher trainee stated that “*BOU mainly utilised conventional face-to-face distance mode operation, but they use some ICT to conduct this programme, e.g., they give eBooks through their eBook website and provide some video lectures for teacher trainees*”. Another teacher trainee

said, “We get weekly face-to-face tutorials in our study centres, but this is not enough. Some teacher educators use digital platforms for us, but it is not mandatory by the BOU authority”. One teacher trainee argued, “Although BOU uses some digital educational resources, its assessment systems are entirely conventional and in-person, face-to-face”. There were mixed opinions among the teacher educators regarding BOU’s blended learning practices focusing on digital educational resources, e.g., video lectures and eBooks. One teacher educator said, “BOU has enough video lectures for blended learning”. In contrast, one teacher educator disagreed with this statement and commented, “BOU video lectures are not enough for blended learning because they are not uploaded in an organised way and many are not up to date. Hence, BOU should diversify its digital instructional materials”. The policymaker of BOU commented

We had some online classes during the time of COVID-19. However, there are some challenges regarding online classes; some teacher trainees misuse this opportunity, like they do not actively participate in online classes, but if in face-to-face classes, they cannot do this. Despite these challenges, as a public open and distance learning university, I think BOU can introduce blended learning as the concept is highly related to the open and distance learning philosophy. Recently, BOU has extended its technological resources, such as improving its website and introducing Webtv, Webradio, e-learning centre, and LMS, all of which have the potential to make significant contributions to the paradigm shift.

In sum, BOU partially utilised blended learning in its B.Ed. programme. It has sound infrastructure, e.g., countrywide 80 sub-regional offices and over 800 administrative staff supporting the conventional mode of delivery of the B.Ed. programme. It needs more technological resources and technologically sound manpower, as well as a new curriculum, policy, and government acknowledgment to introduce blended learning fully.

5.3. The Alignment of BOU B.Ed. Programme with the Targets of SDG4

Teacher trainees were asked to evaluate the BOU B.Ed. programme in terms of the targets of SDG4 by 16 Likert scale items that contained options 1 (Strongly Disagree) to 5 (Strongly Agree). The results showed that most teacher trainees agreed that the BOU B.Ed. programme aligned with the targets of SDG4 in terms of inclusivity items (overall mean of the inclusivity items is 4.0226). However, the mean score of equity items is 2.5202, and the lifelong learning items are 2.4529, indicating a neutral opinion. Table 5.3 presents the detailed results of each item.

Table 5.3. The alignment of BOU B.Ed. programme with the targets of SDG4

Items	strongly disagree (%)	disagree (%)	neutral (%)	agree (%)	strongly agree (%)	mean
Inclusivity						
1. Teacher trainees from all types of secondary schools (e.g., Government, non-government, autonomous, and partial government) can participate in this programme.	7.4	10.7	3.6	48.6	29.8	3.8279
2. Teacher trainees of all ages are able to participate in this programme.	3.6	10.4	3.3	44.5	38.3	4.0355

3. Teacher trainees of all religions are able to participate in this programme easily.	0.0	1.1	1.6	41.8	55.5	4.5164
4. Teacher trainees of all sexes are able to participate in this programme easily.	2.5	1.6	4.9	45.4	45.6	4.3005
5. Teacher trainees from all geographical locations are able to participate in this programme easily.	6.6	18.0	6.8	38.8	29.5	3.6721
6. Teacher trainees of all races (e.g., those from ethnic minority groups) can participate in this programme.	3.0	8.7	8.7	42.9	36.6	4.0137
7. Teacher trainees who have special educational needs (SEN) are able to participate in this programme easily.	6.3	19.1	7.4	37.2	30.1	3.6557
Overall mean of the inclusivity items						4.0226
Equity						
8. My university arranges special classes for those who require additional support (e.g., additional classes for rural female teacher trainees).	25.7	28.1	12.6	22.7	10.9	2.6503
9. My university provides customised educational resources (e.g., large print or Braille formatted modules for SEN teacher trainees)	27.3	29.5	16.7	18.6	7.9	2.5027
10. My university arranges customised assessment tasks for those who encounter challenges with standardised assessment tasks.	22.7	27.0	20.2	21.9	8.2	2.6585
11. During assessments, my university provides additional support for those requiring it (e.g., provision of a scribe and/or reader for SEN teacher trainees).	22.7	28.7	18.3	23.8	6.6	2.6284
12. My university provides financial assistance to economically disadvantaged teacher trainees (e.g., education loans, fee waivers, and scholarships).	42.1	24.6	14.5	12.8	6.0	2.1612
Overall mean of the equity items						2.5202
Lifelong learning						
13. My university provides lifelong self-paced learning opportunities through learning centres.	33.3	33.1	13.9	13.4	6.3	2.2623
14. My university provides lifelong opportunities through a mentorship programme.	32.0	29.0	18.3	14.5	6.3	2.3415
15. After completing this B.Ed. programme, my university provides opportunities to enrol in teacher	23.8	23.8	19.1	23.5	9.8	2.7186

training courses for continuous teacher professional development.						
16. After completing this B.Ed. programme, my university provides an opportunity to join a teachers' professional learning network.	27.3	28.7	19.7	16.4	7.9	2.4891
Overall mean of the lifelong items						2.4529

Interview data explored some additional information regarding the above findings. For example, regarding inclusivity, one teacher trainee stated,

The enrolment process of BOU is flexible and there is no discrimination in terms of sex, age, location, and ethnicity. Any teacher trainee with a minimum of a 3-year honours degree can apply for this programme. However, BOU takes an admission test, and many teacher trainees cannot pass it, so they cannot be admitted.

Another teacher trainee said, “All of the study centres of BOU are located in urban areas, so teacher trainees from remote rural areas, hill track areas, and coastal areas face challenges to access and continue this programme”. Regarding equity, one teacher trainee argued,

BOU's registration system is flexible, i.e., one will get 5 years to complete the programme, but it has limited facilities for teacher trainees with special educational needs. Its digital educational resources and assessment systems are not customisable for teacher trainees with special educational needs.

One teacher educator argued that,

Although BOU uses a standardised assessment system, teacher trainees with special educational needs generally get informal support from the study centre, e.g., if any teacher trainees are unable to sit on the second or third floor, study centres will arrange their exam to be taken on the ground floor.

Regarding lifelong learning opportunities, one teacher trainee said, “After completing this B.Ed. programme, we can enrol in the Master of Education programme, the Master of Philosophy programme, and even the PhD programme. Still, there are no opportunities for refreshment training or any other training for lifelong learning”. The policymaker of BOU commented,

We are working to develop an alumni network so that B.Ed. teacher trainees can be connected lifelong and carry on professional development. Moreover, as a public university, BOU can provide quality education at the lowest possible cost, which is impossible for other universities. This is a strength that will support BOU in this regard.

In sum, BOU B.Ed. programme is contributing to the achievement of inclusivity targets of SDG4; however, it needs to work more toward achieving equity and lifelong learning targets of SDG4 in its B.Ed.

5.4. Factors Important for Developing a Sustainable Blended Teacher Education Model in Bangladesh

Teacher trainees were asked to rate the important factors for developing a blended teacher education model in Bangladesh using 10 Likert scale items that contained options 1 (Strongly Disagree) to 5 (Strongly Agree). The results showed that most teacher trainees agreed with these items (the overall mean score is 4.3683). The overall mean scores of contextual, institutional, and curriculum factors items are 4.2842, 4.3233, and 4.4652, respectively. Table 5.4 presents the detailed results of each item.

Table 5.4. Factors important for developing a sustainable blended teacher education model in Bangladesh

Items	strongly disagree (%)	disagree (%)	neutral (%)	agree (%)	strongly agree (%)	mean
Contextual factors						
1. The blended teacher education model should increase teachers' digital literacy.	1.9	2.5	3.6	52.5	39.6	4.2541
2. The blended teacher education model should be flexible to include all types of teachers.	1.4	2.2	3.8	52.2	40.4	4.2814
3. The blended teacher education model should provide customised support for those requiring it (e.g., provision of a scribe and/or reader for SEN teacher trainees).	1.1	3.0	3.6	47.8	44.5	4.3169
Overall mean of the contextual factors items						4.2842
Institutional factors						
4. Institutions should provide inclusive enrolment opportunities through a blended teacher education model.	0.8	2.2	6.6	50.8	39.6	4.2623
5. Institutions should utilise a cost-effective blended teacher education model.	1.9	1.4	4.9	47.3	44.5	4.3115
6. Institutions should utilise a blended teacher education model that has lifelong learning opportunities.	2.2	0.5	3.6	42.9	50.8	4.3962
Overall mean of the institutional factors items						4.3233
Curriculum factors						
7. The blended teacher education model should ensure the utilisation of face-to-face and online instructional activities.	0.3	1.9	2.7	42.6	52.2	4.4481
8. The blended teacher education model should provide online and hard-copy educational resources.	0.3	1.6	2.5	42.3	53.3	4.4672
9. The blended teacher education model should arrange online and offline assessment tasks.	0.8	1.6	3.8	43.2	50.5	4.4098
10. The blended teacher education model should be updated regularly through continuous evaluation.	1.9	0.5	1.4	45.4	50.8	4.4262
Overall mean of the curriculum factors items						4.4652

Interview data explored some additional information regarding the above findings. For example, one teacher trainee stated, *“It is possible to create a teacher training model by providing skilled and experienced trainers, appointing sufficient trainers, and arranging well-equipped infrastructure. However, electricity and internet facilities should be provided to all areas”*. Another teacher trainee said, *“Readiness of the teacher trainees is vital for blended teacher education because many teacher trainees, particularly senior teacher trainees, have limited skills in online technology”*. One teacher educator argued, *“Online assessment is a big challenge for blended teacher education because teacher trainees may misuse this opportunity, and due to limited monitoring facilities, it will be challenging to ensure originality of the online assessment tasks”*. The policymaker of BOU commented, *“We are working towards blended teacher education; however, we need policy support from the government because if the government does not approve a blended model, then we cannot run the model for teacher education”*.

5.5. Proposed Sustainable Blended Teacher Education (SBTE) Model for Bangladesh

Based on these findings and the analysis of ten blended teacher education models, including Singapore, Vietnam, and Greece (Kennedy, 2021), this study initially developed a model for Bangladesh (Figure 5.5). To facilitate the attainment of SDG4, this three-stage model incorporates sustainability components and blended learning principles. Initially, the curriculum will integrate the four primary targets of SDG4, which are inclusive, equitable, quality, and lifelong learning. Subsequently, a pre-assessment will be conducted to evaluate its appropriateness for the local educational environment, and then the three-stage process will commence. For instance, the initial semester of the programme will serve as stage one, during which tutorials will be conducted in person and assessments will be administered in person. During this period, learners will be introduced to the online platform for the second stage, which is the second semester. This semester will be conducted online using an appropriate platform. Online tutorials, assessments, educational resources, and instructional practices will be implemented in this second semester. Similar to the initial semester, the third stage, or the third semester, will be administered in a face-to-face format. A post-assessment will be conducted for each cohort to continuously improve the programme. Lastly, learners will have the opportunity to enrol in certain online courses, such as MOOCs, as part of their lifelong learning journey. The learners will be connected through an online platform to facilitate lifelong learning and continuous professional development.

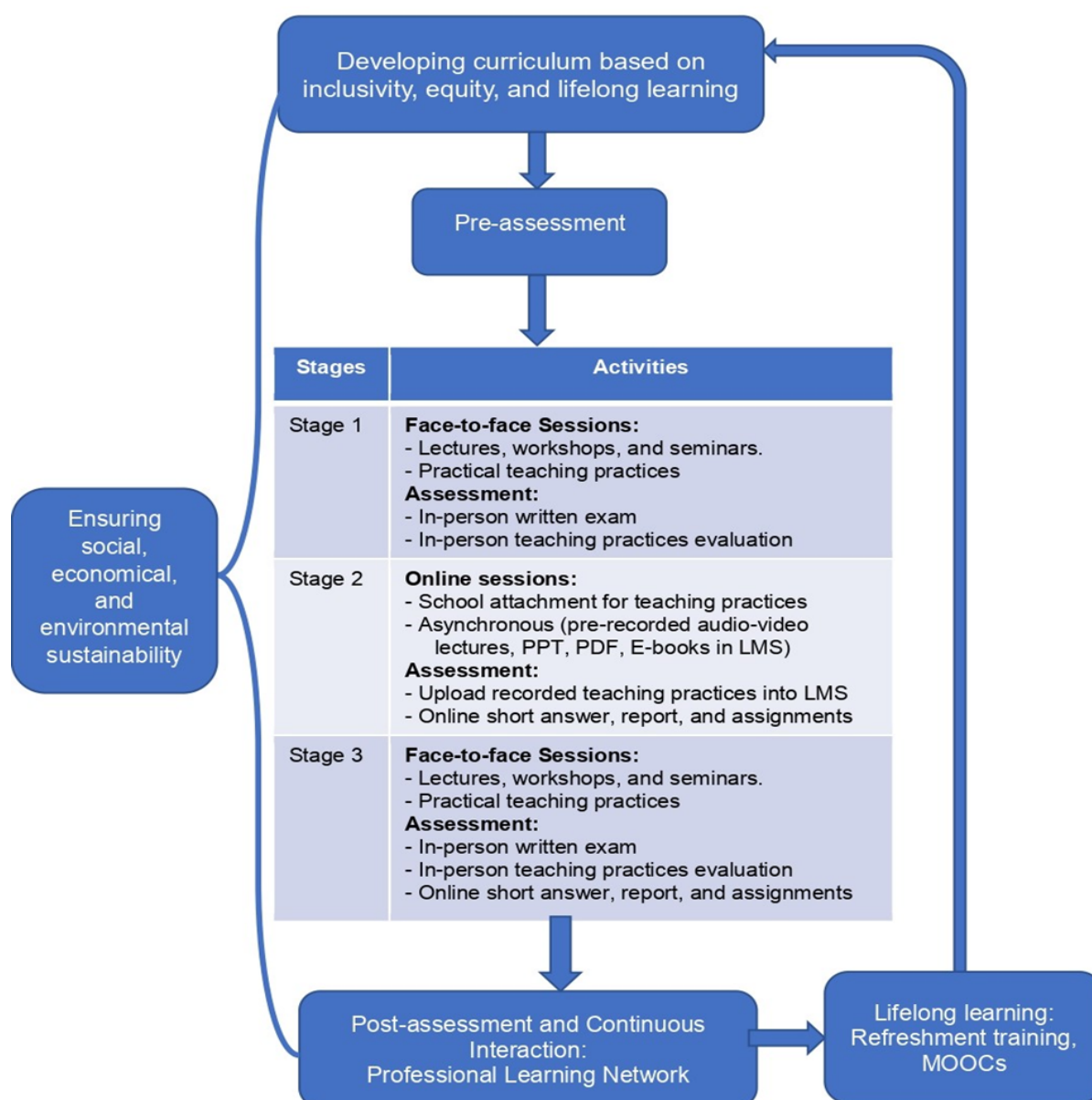


Figure 5.5. The Sustainable Blended Teacher Education (SBTE) Model for Bangladesh.

Source: Author's creation (2024)

6. CONCLUSION

Enabling teachers from underprivileged areas, particularly rural female teachers, to access teacher education programmes equally is a challenge for Bangladesh, creating barriers to achieving Sustainable Development Goal 4: Quality Education (SDG4). Blended Teacher Education (BTE) could address this issue. However, despite having a national blended learning policy, Bangladesh lacks a BTE model. To address this issue, the study develops a sustainable BTE model for Bangladesh based on the findings of this study and the Complex Adaptive Blended Learning System (CABLES) and Community of Inquiry (CoI) frameworks. The study was conducted at Bangladesh Open University, one of Bangladesh's leading teacher education universities. By developing the model, this study's original contribution to knowledge derives from its aim to identify design principles that are inclusive, equitable, and enable lifelong learning to support the achievement of SDG4.

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Distance Reimagined: The Collective Doctoral Journey of Six Wonder Women (WW)

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ABSTRACT

Our research explores the transformative power of peer support in a fully online cohort-based doctoral program through a collaborative autoethnography of our experiences as six women geographically dispersed across the United States and Canada who formed a close-knit subgroup called the “Wonder Women” within a larger distance education cohort. Aligned with the Māori concept of *ako* (reciprocity in learning and teaching), we examine how our virtual community evolved over six years, creating psychological safety and academic resilience within the Innovation and Openness sub-theme. Using focus group discussions and reflective writing, we document the development of our interpersonal connections sustained primarily through digital spaces – WhatsApp conversations, weekly virtual library sessions, and collaborative writing sessions. Our findings reveal how our scholarly, digital community fosters intellectual growth through diverse disciplinary perspectives while providing vital emotional support during academic and personal challenges. Key themes include: the formation of our academic “sisterhood” in virtual environments; the creation of psychological safety that enabled vulnerability; the development of supervisory capabilities through peer mentoring; and the extension of our scholarly identities beyond doctoral dissertation completion. Despite pursuing our doctoral education at a distance, our research challenges the assumption that meaningful relationships require physical proximity and demonstrates how intentionally created digital spaces can support transformative learning communities that transcend geographic boundaries. Our collective experience offers insights for higher education institutions seeking to design inclusive, sustainable support systems for online learners, illustrating how reciprocal teaching and learning relationships within our scholarly community significantly improved our persistence, well-being, and academic success.

Keywords

Collaborative Autoethnography, Online Doctoral Education, Ako, Peer Support, Academic Resilience, Women in Higher Education, Virtual Learning Communities

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INTRODUCTION

In the rapidly evolving landscape of higher education, innovative and reimagined education has become increasingly associated with technological advancement and artificial intelligence (AI) integration. Yet, for us, the authors of this collaborative autoethnography who examine our collective doctoral journey as geographically dispersed women in a fully online distance education program, innovation emerges not from technological sophistication but from the deliberate creation of meaningful human connections across digital spaces. Our experience challenges the assumption that academic relationships require physical proximity and demonstrates how intentionally created digital spaces can support transformative learning communities, illustrating that learner-initiated virtual communities can foster deep scholarly connections that transcend geographic boundaries and significantly contribute to doctoral persistence and completion.

Through our study of the “Wonder Women” (WW), our self-designated subgroup within a larger doctoral cohort, we drew on focus group discussions and reflective writing to explore our experiences with innovative distance education. Findings from our study reveal how our virtual community fosters intellectual growth through diverse disciplinary perspectives while providing vital emotional support during academic and personal challenges, demonstrating the transformative power of learner-driven digital connections. Our shared journey illustrates how distance education can be transformed through the formation of what we term an “academic sisterhood,” organically grounded in the Māori concept of *ako* (reciprocal learning and teaching), where innovation manifests in the depth of interpersonal connections, the creation of culturally safe online learning spaces, and the development of sustainable engagement systems that extend far beyond formal academic requirements.

This paper documents our WW group collaboration during our six-year doctoral journey at Athabasca University and beyond, offering insights for higher education institutions seeking to design inclusive, sustainable support systems for online learners, while showing how reciprocal teaching and learning relationships within scholarly communities can significantly strengthen persistence, well-being, and academic success.

Background and Context

Our WW group formation is rooted in specific institutional conditions and program design that both shaped our doctoral journey and created the context within which our collaborative relationships could emerge. Understanding AU’s distance education environment helps illuminate how we, six women geographically dispersed across North America, found each other within a larger cohort and developed a support system that extended far beyond the formal academic structures.

Athabasca University (AU) and Our Degree Program

AU's leadership as an open university has been notable since its establishment in 1970 with a mission to serve learners of northern Alberta (Clark, 1972). The provincial elections of 1971 brought new direction to this institution that did not yet have enrollees. From 1972 to 1975, AU experimented with a distance learning pilot program for nontraditional learners (Athabasca University, 1972; Byrne, 1989; Daniel & Smith, 1979; Pulker & Papi, 2021). Following its success, AU received permanent status in 1978, building upon distance learning strengths including commitment to openness, flexibility, and an industrial model of distance education within the global proliferation of open universities (Daniel, 1996; Tait, 2018).

Prior to the Internet, AU supplemented correspondence with educational television and satellite-based communications (Athabasca University, 1981). With Internet adoption during the 1990s, AU added master's programs in Distance Education and Business Administration (MBA), therefore establishing the world's first online MBA (Athabasca Advocate, 1995; Athabasca University Faculty of Business, n.d.). The university moved undergraduate courses online during the early 2000s and became the first North American university to offer a Doctorate of Distance Education program in 2008 (Koole, 2007; Pulker & Papi, 2021).

The Doctor of Education in Distance Education (EDDE) is an 18-credit program, designed for individuals who want to work in leadership roles, research, or academic teaching related to distance learning (Athabasca University, 2025). Each annual intake begins with a one-week on-site orientation, followed by two research seminar courses in the final two years. The first seminar supports proposal development, and the second is completed once the proposal is defended and the research journey is well underway.

Cohort 11 and Forming the WW Group

We commenced the EDDE degree in 2018, the 11th year of this AU doctoral program. Due to the rigorous commitment required in the first two years of our courses leading up to the dissertation stage, most of us experienced times of discouragement and overwhelm. As discussed later in the literature review, the statistics of doctoral dropouts are significant. Ames et al. (2018) identify isolation and distance as significant barriers to completing dissertations. Consistent with these patterns, our Cohort 11 (as formally referred to by our intake year), initially the largest cohort in the history of our program, with 21 students at orientation week, gradually began to shrink. By the end of the second year, only 16 doctoral students remained.

Technology facilitated our desire to stay connected across time zones and contexts, as Cohort 11 members attempted to mitigate the risk of going our disparate ways. Kathryn initiated monthly email check-ins for the entire cohort, while Rima started Saturday morning Zoom meetings to discuss assignments and support each other. However, as participation gradually dissipated among the larger cohort, a core group of us continued meeting regularly.

In March 2020, we found ourselves perfectly positioned to support the world's transition to online education. Chadia, Margaret, Mae, and Rima collaborated on a project and a series of workshops that proved instrumental in bringing us closer together. A bond of collegial trust formed, leading to intensified

WhatsApp conversations and Saturday Zoom meetings that included information sessions to prepare us for the research stages of our program. However, while others attended sporadically, only six of us sustained consistent participation throughout the proposal phase and beyond. As we were all women, we jokingly and affectionately chose to call our group the “WW” standing for the “Wonder Women” or “Wonderful Women” or both.

Team Diversity and Library

Teams that reflect diverse cultures and backgrounds are better positioned to understand different communities and meet the needs of others in an increasingly globalized world (Ponet et al., 2024). The six of us in WW are uniquely different people from multiple countries and time zones, with diverse backgrounds spanning digital pedagogies, nursing, linguistics, and history.

When AU adopted Microsoft Teams, we set up a dedicated virtual space called *The Library* for our WW group to use anytime, and we continued meeting in *The Library* throughout our doctoral courses. As we entered the dissertation proposal phase, our *Library* sessions evolved to include helping each other navigate committee formation, methodology alignment, literature reviews, and presentation rehearsals. Spontaneous collaboration became routine through WhatsApp messages like “I’m heading into the Library. Anyone want to be scholarly with me?” A WW member almost always joined. Our sessions ranged from silent writing with hourly progress reports to impromptu “crisis” meetings whenever a member experienced extenuating circumstances.

While physical meetings were rare and typically involved only a few of us at conferences or special occasions, these gatherings further strengthened our bonds, with those present always making efforts to virtually include the other WW members.

REVIEW OF RELEVANT LITERATURE

Our collaborative experience, built primarily through virtual connections yet sustained by deep relational commitments, aligns with established scholarship on how women create supportive learning communities and develop ways of knowing that extend beyond traditional academic boundaries.

Ways of Knowing

Belenky et al. (1986) describe supportive relationality as foundational to *Women’s Ways of Knowing*, but our experience is more than that. We are a culturally diverse group of women who move in intersectional spaces where consideration of gender, race, class, and power frequently worked their way into our discussions and/or dissertations. This intersectional approach moves feminism and Noddings (1984) notions of morality and an ethics of care into non-binary spaces (Hooks, 1994, 2003) in pursuit of education to support equity and social justice. This opened us to more relational ways of being with each other, offering safe space to practice the art of providing loving critique and encouragement. Now, we make space to explore common threads that emerge when we talk about and reflect upon the themes represented as social constructs that tell the stories of our experience and offer insights to others (Archibald Q’Qum Xiiem et al., 2019; hooks, 1984, 1994, 2003; Lange, 2018; Wilson, 2008).

Indigenous Ways of Knowing

Indigenous communities globally have unique cultural practices, yet there is a unifying thread among most Indigenous Peoples that honours sacred relationships between People and Land rooted in

reciprocity. This is found on Turtle Island (Starblanket & Kiiwetinepinesiik Stark, 2018; Wilson, 2008) and is captured in both the Northwest Marine People's seven fundamental truths (Brown & Brown, 2009) and the Polynesian concept of *ako* (Vaioleti, 2011). The fundamental truths speak to the relationship between humans and the planet: of creation, connection to nature, respect, knowledge, environmental stewardship, sharing, and adapting to change (Brown & Brown). Similarly, *ako* is a process and vision for reciprocal teaching and learning with the goal of harmonious and sustainable relationships between people, the environment, and their spiritual entities (Vaioleti, 2011). *Ako* "affirms the individual roles as a member of a community, reinforces the value of learning as a contribution to the wellbeing of the collective and acknowledges that modelling and the practice of a learning experience may occur incidentally as well as in planned ways" (Morrison & Vaioleti, 2011, p.307). Everything is connected. There is an underlying theme of reciprocity that links ways of knowing across oceans and time to our small online group and others like it that emerge from a need for community and connection in order to thrive and survive the doctoral journey (Ames et al., 2018; Berry, 2017; Denman et al., 2018; Hoven et al., 2020; Payne et al., 2024).

Resilience in Doctoral Programs

In Canada, doctoral students in science, technology, engineering, mathematics, computer and information sciences [STEM] programs graduate sooner and at higher rates than doctoral students in business, humanities, health, arts, social sciences, education, legal, and environmental conservation [BHASE] programs (Statistics Canada, 2025). Five years after admission into a doctoral program, 47% of STEM students and 25% of BHASE students have graduated; by 10 years after admission, the percentage has increased to 79% of STEM students and 66% of BHASE doctoral students. Breaks are frequent in doctoral studies, and the longer a student takes a break, the harder it is to come back and finish the work (Statistics Canada and every doctoral student ever). Jourdan-Ionescu et al. (2021) identify a number of protective factors for doctoral students such as self-regulation and self-efficacy, supportive family relationships, and the many social, geopolitical, structural, environmental factors created to support the student success. However, they also note that being of the non-dominant culture, having babies while in school, financial concerns, and/or having limited social support naturally contribute to attrition (Jourdan-Ionescu et al., 2021).

Given this, what contributes to doctoral student resilience? Ames et al. (2018) found small cohorts of students who worked together supported each other through their programs and had easier faculty/supervisor access were more successful than those left to sort out the research journey without scaffolded instructional support. From the works of Farrow et al. (2024) in their *Guide to Doctoral Supervision*, the requirements for faculty to be effective as supervisors present a tall order. Most faculty members are overloaded with work in their teaching capacities alone. A successful supervisor has to sensitively switch roles as needed by their mentees to keep them motivated. Farrow et al. list four key roles: the mentor, the model, the manager, the muse, and the mediator. Each of these requires sophisticated skill in and unto themselves. Cohort communities such as the WW richly supplement the support sought by doctoral students in all of these aspects. Hoven et al. (2020) found that their EdD cohort model promoted resilience by fostering a sense of community, peer support, and consistency while intentionally cultivating a network of scholars. Similarly, Berry (2017) found online doctoral students who participated in cohort study groups and who established an ongoing connection with faculty were more likely to establish a social network with classmates, feel less isolated, and were more likely to be successful in completing their online degrees. Denman et al. (2018) found their small

doctoral support group provided motivation to keep going, friendships that extended into personal lives, and a cooperative, collaborative approach to research or technical challenges faced during the dissertation process. The group supported accountability by sharing progress updates, cheering on group members, encouraging each other, and/or asking for or providing technical or personal help and support (Denman et al.). Payne et al. (2024) identified two core themes that supported connectedness in their culturally specific study in African American female doctoral students completing blended or online doctoral programs in counselling: authenticity, and safety. Authenticity included sub-themes of genuineness, encouragement, modeling, transparency [absence of masks], and being supportive. Subthemes that emerged from the concept of safety included the absence of backstabbing, a non-competitive environment, good rapport and consistency, and a space free of judgement where intention was brought by all to create authentic, safe space.

METHODOLOGY AND RESEARCH PROCESS

Given that we are both the researchers and participants exploring our own WW experience, this work naturally falls within collaborative autoethnography, which embodies our practice of engaging in reciprocal teaching, learning, and writing.

Collaborative Autoethnography

Collaborative autoethnography extends traditional autoethnographic inquiry by incorporating multiple voices and perspectives into the research process (Chang et al., 2016). This methodology enables researchers to collectively examine shared cultural experiences while maintaining individual reflexivity and voice (Lapadat, 2017). Unlike traditional ethnographic approaches that position researchers as external observers, collaborative autoethnography positions participants as co-researchers who jointly construct meaning from their lived experiences (Chang, 2013).

Our approach aligns with collaborative autoethnography's foundational principles: collective reflexivity, dialogic meaning-making, shared accountability, and democratic research relationships (Chang et al., 2016). Particularly relevant to our study is the methodology's emphasis on relational ethics and ongoing negotiation of consent, voice, and representation (Lapadat, 2017). As Mendus et al. (2021) note, collaborative autoethnography requires "standing together through difference" while maintaining individual agency and perspective.

Central to our methodology is our shared purpose of completing doctoral studies, which provided both the context for our relationships and the motivation for sustained collaboration. This unity of purpose, while not always present in collaborative autoethnographic research, proved pivotal in creating the trust and commitment necessary for deep reflexive work.

Research Process

Our collaborative research process began with collective proposal development, where the six members of our WW group negotiated our research approach and finalized guiding questions through consensus. We obtained informed consent from all participants, acknowledging our dual roles as researchers and participants.

The following questions guided our exploration:

- What has being part of this subgroup, the WW, meant to each of us?
- What have we contributed to and gained from the WW group?
- What motivated our continued engagement over the years?
- What are the highlights and pivotal moments of our experiences within the WW group?
- How has our involvement influenced and impacted our doctoral journeys and beyond?

Our data gathering process involved two virtual focus groups, held virtually on August 21 and October 5, 2024. During these sessions, we allowed our conversations to flow freely while reflecting on the aforementioned guiding questions. We recorded both sessions, with two team members handling transcription, first using automated technology, then manually refining the text while paying particular attention to punctuation and linguistic nuances to preserve individual voices (Poland, 1995). Some members also chose to write individual reflections to supplement the group discussions.

For data analysis, two team members conducted thematic analysis using inductive coding procedures to identify emergent themes (Braun & Clarke, 2006). For data interpretation, we established a shared digital folder accessible to all members, enabling collective review and validation of transcripts and coding decisions. Throughout the research process, we maintained the iterative cycles of writing, sharing, and revising that Chang et al. (2016) identify as central to collaborative autoethnography.

FINDINGS AND THEMES

Our data analysis resulted in the emergence of eight interconnected themes that demonstrate how intentionally created digital spaces within a doctoral-level distance education program can foster

sustainable learning communities (Figure 1). Collectively, these findings exemplify the transformative potential of distance education communities rooted in the Māori concept of ako: reciprocal learning and teaching.



Figure 1. Eight Interconnected themes from collaborative autoethnographic analysis of the WW group experience

Ako: the Foundation of Our Reciprocal Learning Community

As we reflect on our WW journey, we recognize that our experience is deeply rooted in ako, which has naturally become the foundation of our collaborative relationships and shared learning practices. As previously stated in the literature review, ako encompasses the idea that knowledge flows in all directions among participants, with each person serving as both teacher and learner. While we did not originally set out to embody its principles, this concept has organically shaped our ongoing journey.

What becomes apparent as we look back at our collective doctoral journey is how spontaneously we fall into these reciprocal roles, where our most meaningful learning comes through the continuous exchange of wisdom, support, and expertise as equals. As Rima reflects while discussing her contributions and gains from being part of the WW:

I think I gained mentorship skills, like being a mentor and a mentee at the same time. It was both ways. Of course, sometimes I'm mentoring, sometimes I'm being mentored, but this level of peer-to-peer mentorship was pretty advanced within our group.

Kathryn further illustrates this reciprocal dynamic when she captures its essence while discussing what motivates our continued engagement, "recognizing that it was so valuable to me that I wanted to be valuable to somebody else. Like this reciprocity that ends up kind of forming in this group."

Through these ongoing, reciprocal interactions of mentoring, being mentored, teaching, and learning, we find ourselves co-creating knowledge, a process that Mae recognizes as demonstrating "theory in practice of what a real community of inquiry is". Kathryn further highlights this collaborative knowledge construction when she notes how a lot of her "understanding of the field and research methods have come out of our conversations that have gone beyond the classroom."

Saudia's experience also exemplifies this cross-pollination of knowledge when she reflects on how the diverse expertise of our WW group transformed her approach to writing her dissertation:

For example, I would come to our library, and if I was puzzled about something, I was kind of thinking, "Okay, how am I going to write this in relation to nursing?" Because that's my background. But then I would come to the group and get support from like Chadia, we're discussing instructional design, and then I would get support from Kathryn, and then other people. So, there's so much diversity in the group. For me, something I gained was being able to really diversify my own writing. I was able to think of it in this much more widely applicable way, and that was so important to me, and that helped me write my dissertation.

Eventually, our organic embodiment of ako allows us to create a learning environment where the expertise of each member enriches our individual and collective learning, fostering relationships that extend far beyond traditional academic collaboration into what we refer to as an academic sisterhood.

Virtual academic sisterhood: Bonds deeper than physical presence

The term "academic sisterhood" emerged organically from Kathryn during our early WW interactions, a concept that resonated so deeply with all of us that it became central to how we understand our relationships. As Kathryn recalls while discussing what this group means to her, "We've used the term academic sisterhood before, and that's the term that I keep going back to."

Chadia expands on this concept, elaborating on the multifaceted nature of our sisterhood when she shares:

I would say this group has been the best company, support, sisterhood, brilliant minds, all those deep discussions, the understanding piece that I know nobody ever would understand what I'm talking about, except for you. Also, the amount of learning that's occurred at all levels, not only academic learning, but from our lives, from our experiences, from what we shared, the challenges, the family, or anything else that's happened throughout all these years to us, and finding solutions together, trying to be there for one another.

This comprehensive understanding of our sisterhood, encompassing intellectual, emotional, and personal dimensions through remote interactions, challenges not only assumptions about limitations of virtual connections but also the necessity of physical proximity for creating meaningful academic relationships. Mae powerfully articulates this notion when she observes that our experience demonstrates "that the bonds can go as deep, or deeper, than a face-to-face relationship". The depth of these virtual connections surprises some of us, particularly Chadia, who initially resisted online education. Chadia's transformation in perspective captures the profound nature of our virtual bonds:

I was so against any degree online...the relationships and the relational part, or the social part, I thought it would be better in-person. But I've never connected with my classmates the way I connected with this group online behind the screen.

Chadia's reflection also reveals the intensity of our virtual relationships that extend beyond typical friendships or academic collaboration. Describing the compelling nature our sisterhood, Chadia remarks:

There were moments when it was like you have to connect. It's like you didn't talk to your mom. I would talk to you, search this group more than searching for my own mom or family. You have that thirst to connect and to share because of so many things in common.

Echoing Chadia's sentiments, Rima positions our deep connections within her most essential relationships, saying: "it was as essential as being with my family, and drinking, and eating is to be with you and communicate with you."

Margaret eloquently articulates the profound nature of our virtual sisterhood when she reflects on the paradox of distance and closeness, exclaiming with deep emotion:

You are all so dear to me, and how many minutes have we been in each other's physical presence in the same geographic location? But that doesn't matter, because we are with each other. It amazes me to think that I'm sitting here in front of this, and I'm looking at the water and the trees and everything, and the close connection in my heart that is reaching out to all of you, and I feel this circle of energy that links us, despite the fact that... thousands of miles apart, but our hearts know each other.

Margaret's remarks ring particularly true because, since our orientation week at the beginning of our doctoral journey in August 2018, we have not been all together in the same physical location. While some of us have planned to attend conferences together or arranged small gatherings for lunch or dinner when visiting each other's cities, these occasional face-to-face encounters represent only a fraction of our shared experience. However, the physical distance has not stood in the way of building our profound virtual academic sisterhood, partly because of our intentional creation of safe and responsive digital spaces.

Intentionally Created Digital Spaces: Psychological Safety and Responsiveness

Our virtual library emerges as the beating heart of our academic sisterhood, demonstrating how intentionally designed digital spaces can become meaningful places for scholarly work and personal connection. Margaret describes this as "bringing intention to create a place within digital space". To further explain, she articulates:

We didn't just have a random Zoom call once a week, or every two weeks, but we created a place where we could meet and collaborate and support each other, and, you know, be together. It was the library. We met in the library, and we would work together in the library, and I would say to my husband, I'm going to spend a couple hours in the library, and that community of even just having the little picture of seeing whoever's in the library with me in the corner of my screen as I got things going on the other screens, we're still working together, apart. And we're apart, but we're working together.

This paradoxical state of being "apart but working together" creates a unique form of digital intimacy that transcends physical distance. The subtle awareness of each other's presence, even in silence, becomes a source of comfort and connection. Rima effectively captures this when she describes the familiar nature of our shared virtual library:

The place means something to me because it's our dating spot. So, I go and I sit in it, and I know that there's a chance that somebody might come by their computer, open, and see that I'm there, and come here and sit with me. And even if we just sit close together, working together quietly, I hear them breathe. I hear them cough. I just glance at them every now with the corner of my eye. I know they're there, and I know if I need them, they are going to jump in, and if they need me, I'm going to be here for them.

This sense of reliable presence and mutual availability became the foundation for our most intensive collaborative experiences. Mae vividly illustrates this collaboration in her reflective piece, describing it as The Blitz:

Saudia and I decided to do a marathon for the first full dissertation draft. Both of us had a defended proposal and had completed the action research. Before us lay the long road of documentation in scholarly format - it was time to write about the data collection, analysis, findings, and conclusion. Even though we were developing different concepts with different methodologies, the goal was to reach that full draft within three months – year end. Every day we would reach out and say “Do you have an hour, one hour?” We would meet in The Library and state our intention for that hour. At the end of the time, we would regroup and state what we had accomplished (or not). Then, we would always say “Do you have one more hour?” Sometimes this would carry on for several hours of what we called “the blitz,” which was an intense use of time. There was something indescribably symbiotic about working on our papers with the other person a few screen inches away focussed on the same challenge with the same end goal, the same messy hair, the same coffee refill nearby. We increased the pressure leading up to the end of the year, spending more time with each other online through the holidays than we did celebrating the season. On that triumphant day, we counted down from 10 together and hit the “Submit” button to upload our completed drafts. Since then, both of us often state how this achievement could only have happened through our online “blitzes” together.

The responsiveness of our digital spaces that Mae describes extends beyond the library through our multimodal communication system. Chadia marvels at the transformative power of our connectivity, which starts with a WhatsApp message announcing that one or the other is joining the library impromptu:

I don’t know what’s the magic of the WhatsApp group of somebody saying I’m going to the library... that message popping up... You get energized and you connect, and you sit there and you do the writing. It’s like you’re a different person. That just little pop-up message, and you’re there, and you’re doing the work. It flips the whole attitude, mood, energy.

In this quote, Chadia describes the immediate motivational effect of these spontaneous invitations to join the library, transforming her individual lack of energy or desire to write into collective productivity and connection. Needless to say, we have all spent countless hours in our virtual library trying to work on our dissertations, which extended over years, during which we found ourselves inhabiting this liminal space between virtual and physical worlds. This has allowed for the integration of our personal and academic lives, creating an environment where the boundaries between our scholarly work and personal connection naturally dissolve. Our digital library has gradually transformed into a space where we observe each other’s daily realities and celebrate the complete identities we bring into the learning process. Kathryn vividly describes this intertwining when she recounts:

Some of the stories that stand out to me from the library, at least, are the cameo appearances from the family members or the animals in our lives, or the different working environments that we’ve had, the different working habits that we’ve all had, and it’s just those little things that made each person beautifully unique and kind of stand out, as those things that just made me like you more as people that had nothing to do with your academics, but those kind of always stayed in my heart.

These glimpses into each other's daily realities that Kathryn describes provide a clearer perspective to appreciate the context of each of our WW group members, and respond with genuine care and support when circumstances become difficult. Consequently, knowing that there is understanding rather than judgment creates an environment where members feel comfortable showing vulnerability and being open about their struggles, fostering an atmosphere of psychological and cultural safety and responsiveness.

Safety and responsiveness

Within our environment, we create what Margaret identifies as a:

Community of safety together. We can come in here and cry, or laugh, or be so mad, and swear up a blue streak and know that there's no judgment. There's love and support, and there may be differences in opinion, which is part of the richness.

This safety enables authentic vulnerability that proves essential for our growth and persistence throughout our doctoral journeys, and the recognition of this safety becomes explicit among our group members. In this regard, Kathryn acknowledges that we provide *"the safest place possible with the best people possible to give this a try"*, when talking about trying a new approach to our research, while Rima reflects on the palpable nature of our comfort within the group: *"It felt so safe, like our group felt so safe"*. This collective sense of safety allows us to share struggles and insecurities that we might not reveal elsewhere, creating space for honest discourse that strengthens both our academic capabilities and personal resilience.

Openly sharing our struggles eventually leads to the emergence of what we can describe as therapeutic qualities within our group dynamic. Such therapeutic qualities become evident in how Chadia describes her experience:

When you go to that therapy room where there's a circle, and you sit there and you talk about stuff... So many times, I come to this group and I just start crying, or talking about whatever, not necessarily academic, but personal things. And you have all the support needed, and you leave the room happy and satisfied and motivated and uplifted... Yeah, therapy in that sense.

As Chadia highlights, this therapeutic dimension to our interactions enables us to process both academic and personal challenges in a supportive environment. Margaret's professional expertise in cultural safety helps us understand what we have accomplished, as she explains:

Also, the willingness to have a conversation that isn't always comfortable, perhaps, you know, to move into those spaces to try and find a respectful way to bring curiosity, to bring compassion, to our ways of being with each other. I've been writing a lot about cultural safety and trying to create culturally safe online learning spaces, and I think this is what we have achieved in this environment.

This cultivation of culturally safe space enables us to address sensitive topics while maintaining respect and understanding. It is worth noting that this safety does not fade away after the completion of our doctoral journey, but rather has an enduring effect that Saudia highlights when she notes:

And the other thing, at least for me, in terms of continued engagement, was that we kind of have this history, it's like a safe place for me. I learned that I could go somewhere like this group, and even when I felt very defeated ... I came to a place where I could be very honest and transparent about that. So I feel I'm always going to kind of have more challenges and things

that come up, and this will continue to be a place for me where I can openly say I felt defeated, or I don't know what to do.

While Saudia speaks of feeling defeated and experiencing challenges, which resonates with all of us, the interesting aspect of our group dynamic is that sharing such moments with each other did not leave us feeling weak or dependent. Instead, our safe space has become a source of strength and resilience, enabling us to face challenges with greater courage and persistence than we might have achieved alone.

Academic Resilience: Collective Persistence Through Adversity

As presented in the previous section, our WW community demonstrates remarkable resilience through our collective ability to persist through individual and shared challenges that could easily derail doctoral progress. Building on the psychological safety and responsive digital spaces we have established, this resilience emerges not from individual strength alone, but from the interwoven support systems we create that enable us to weather academic storms, personal crises, and moments of crippling self-doubt. When members face overwhelming obstacles or consider abandoning their doctoral journeys, our group creates what becomes a safety net of academic and emotional resilience.

Reciprocal Peer Support and Informal Mentorship

Our collective resilience manifests most powerfully through our commitment to preventing each other from abandoning our doctoral journeys. This support system operates through what we recognize as informal mentorship and quasi-supervisory relationships that emerge organically within our group. When members face overwhelming challenges or consider withdrawal, the remaining WW mobilize to provide intervention and encouragement.

Margaret's experience exemplifies this collective persistence when she reflects on how our support became essential to her completion: "If I am successful at completing defending... that's 100% the support of our group... when I've been ready to let go, you've held on and lifted me up and all of you."

This peer support extends beyond emotional encouragement to include academic guidance that often supplements formal supervisory relationships. This basically emerges from our diverse disciplinary backgrounds, which creates a rich resource pool for consultation and problem-solving. In this regard, Chadia remarks:

Instead of going to our supervisors when you're stuck or send an email, we had this group that provided immediate support... because we come from different backgrounds, so we have different perspectives and even more chances and options to even learn something about what you're doing.

Saudia confirms:

I've been able to witness everyone else where you come and you have people to consult with and advise you, even before it gets to a supervisor, right? So, in a sense, it was really helping to make us efficient each individually, because you're able to answer these questions and not wait two weeks for an email....I had a particularly challenging time with one of my committee members, and this group was such a huge support, and gave me so much advice on what to do because I was so inexperienced in that area. ...So, having this group to consult with was invaluable.

Beyond this practical academic support, our WW group also provides intellectual belonging and community. Mae's experience effectively captures the transformative nature of finding this intellectual community and the impact of our collective support on both academic and personal development:

It's like having this, not only a kind group of women, but powerhouse thinkers; people whose opinion you really can listen to, and take from, and share with, but others they don't even get it. They don't even see what I'm talking about, you know, which is usually the case. So it's been, just a joy to have people to discuss advanced topics with, along with, just everyday things, pretty amazing. Where do you find that?

In this reflection, Mae illuminates the rarity of finding a community of "powerhouse thinkers" who can engage with complex ideas while maintaining genuine care for each other's wellbeing. Her question "Where do you find that?" speaks to the exceptional characteristic of what we have created: a space where intellectual rigor and emotional support converge to create remarkable academic resilience.

Peer leadership and inspiration

Within our resilient community, peer leadership emerges in ways that sustain our connections across years of challenges and successes. Chadia acknowledges this leadership, recognizing the efforts that Rima puts forth to maintain group cohesion:

We do love each other, and we do look for each other and we're there for each other, but I think it is you, Rima, that really has kept this group going and connected more than myself or any other in this group... without you, I am not sure this would have been continuing to this point, which makes me think there's got to be somebody like in any family or community. Somebody who's always there to keep everybody connected.

As Chadia describes, this peer leadership operates not through hierarchy but through consistent availability, encouragement, and the cultivation of connection among community and family members, facilitating our ability to continue to meet, communicate, and inspire one another through both challenging and celebratory moments.

The inspirational dimension of our resilience becomes evident in how we draw strength from witnessing each other's persistence and achievements across different life circumstances. Saudia describes this transformative dynamic in detail when she says

Because everyone was so different, I was looking to other people in the group as inspiration, and that really was helpful to me. So, for example, I remember at one point, I was looking at Chadia thinking, oh, she has, this newborn baby, and she's managing and doing so well and thriving, right at a time in my life when I was having my own child. So, it was inspiring to me. And then, I remember, I would talk to Mae, and she's in a completely different time in her life, and she's like learning and doing all these advanced things. And then that was at a time when I was trying to learn how to work NVivo. So, I think, kind of the biggest thing was, having that inspiration from other people, whether they knew it or not.

As Saudia mentions, this inspiration is not limited to academics, but rather operates across different life circumstances, creating a web of mutual encouragement that sustains individual persistence through collective example and support, whether members are consciously providing inspiration or simply living their authentic experiences within our WW community. This inspirational dynamic

deepens over the years, strengthening our bonds and reinforcing our commitment to each other's success and needs long after formal academic requirements are completed.

Temporal commitment and life integration

Building on the reciprocity, safety, resilience, leadership, and inspiration discussed in previous sections, our WW group has developed a temporal commitment that extends far beyond the typical duration of our doctoral program. For instance, our sustained engagement while completing our doctoral journey, and continuing beyond graduation, reflects the deliberate efforts that many of us make to maintain meaningful connections over the years. This temporal dimension distinguishes our experience from episodic academic collaborations, creating instead what becomes a continuous thread woven through the fabric of our personal and professional lives.

The depth of our temporal commitment becomes evident in how we prioritize group engagement even when competing demands intensify. Rima reflects on this commitment through the lens of investment, when she says:

I invested a lot of time in this group... people might think of it as if it was at the expense of my family, at the expense of my children, at the expense of my work. I felt like I was very, very generous in giving my time. Every single time we had something, I put it as a priority. But it wasn't only giving. It was an investment.

This perspective reveals how our temporal commitment extends beyond scheduling convenience to become a deliberate choice about where we invest our most precious resource: time itself.

The significance of this choice emanates from the fact that time is a rare commodity for us as women juggling work, family obligations, and doctoral studies, especially because many of us have children and other caregiving responsibilities. Yet, despite these competing demands, we consistently choose to invest time in our WW relationships, where our personal and academic lives become most intertwined when we choose to plan major life decisions with other WW members. Chadia's account of family planning illustrates this remarkable integration, as she shares laughingly:

I planned my second baby with Rima. We literally had a plan, right?... I didn't have the courage to move forward with that while doing my doctorate. Then it felt, yes, yes, this is reasonable and feasible with the planning and consultation between us.

This and many other life stories accumulate to create what Rima describes as our "shared history" that strengthen our bond over time:

We have shared experiences. When we talk about something that we lived together, like with a certain instructor, or visiting a conference together. We have a shared history, and this creates some sort of not only closeness, but it creates a bond, and this has evolved. It kept ramping up and has evolved over the years.

Within the same vein, Mae comments:

We were in those years together, doing those courses together, and going through this degree program together, even before we got to our dissertation research. ...But as we moved along, the six of us got really close, even closer, as we ratcheted our way through our dissertation research.

Similarly, Margaret articulates how our multimodal communication enables our sustained temporal commitment despite life changes and relocations, noting:

There's the Microsoft Teams, but we also have stayed connected through WhatsApp and sometimes on telephone as well. ...when Saudia went to Vancouver and I did a day trip and went to see her. And when I went to Toronto, before COVID happened, I went and stayed at Rima's house. We've had multiple ways. It hasn't just been this one modality.

This sustained availability across multiple platforms and occasional face-to-face encounters demonstrates how adopting a multimodal approach to our communication allows us to maintain strong connections despite geographic dispersion and evolving life circumstances. It also enables us to narrow the distance inherent in online doctoral programs.

Innovation and Openness: Challenging Educational Paradigms

Throughout our WW journey, our experience challenges notions about the limitations and possibilities of online doctoral studies by presenting a form of educational innovation that emerges organically from student initiative rather than institutional design. Our experience also demonstrates how learners can create powerful academic communities that reshape distance education paradigms.

Chadia's perspective illuminates the paradigm-shifting nature of our experience when she says:

This group is a showcase. It showcases how it's done...Well, I've never felt connected to anyone, colleague or friend or classmate or somebody that I've collaborated with as much as I did with this group, and it has always been done virtually...we have experienced it.

By articulating what we all feel, Chadia positions our experience as proof of concept for innovative distance education approaches, establishing our WW community as a living demonstration of educational possibilities that many institutions have yet to realize.

In addition to demonstrating possibilities, the innovation of our approach also manifests through our openness to explore uncharted academic paths, and willingness to push disciplinary and methodological boundaries beyond conventional frameworks. Kathryn captures this when she notes how our group encourages risk-taking:

We have all pushed each other to take risks in our doctoral journeys, and I don't know that any of us would have taken the risks that we did without each other's encouragement to do so, because it's scary to take a risk, right? There's the element of failure, there's the sense of the unknown, there's a sense of having to get other people on board with this crazy idea that you want to pursue for a dissertation, and to have everybody in this group say, "You know what? That really is worth the risk. Go for it." And I think we've all done that for each other.

In this quote, Kathryn effectively captures the essence of countless moments when we would run by the group our considerations to adopt nontraditional methodologies, innovative theoretical frameworks, or unconventional dissertation presentations, and receive encouragement to pursue them despite their inherent risks or difficulties in obtaining institutional approvals. This supportive environment for academic experimentation extends beyond individual research projects to encompass broader questions about the future of doctoral education.

Mae confirms this when she highlights how motivational it is to "get that feedback of, 'Yeah, just keep going. Oh, that's amazing!' Or, just to have a group of intelligent women that would actually comment

on what you were doing”. This observation suggests that we have created a living laboratory for educational innovation that validates creative scholarship while simultaneously pushing practical applications in new directions and expanding our perspectives beyond our own respective disciplines.

Transformative learning across disciplinary boundaries

Our diverse academic backgrounds create opportunities for our ongoing interdisciplinary learning and growth. In this regard, Kathryn reflects on her “exposure to methodologies and exposure to disciplinary applications of what open and distance education can mean and how it can be so transformative in terms of research and applying it”. She marvels at the diversity of knowledge in our group, saying:

I would never think of nursing applications... Margaret, what you're doing with decolonization is totally different from Saudia, what you did with simulation ... Mae, what you did with HAVATAR; just phenomenal! ... Chadia, I would never think of language, and what that means in terms of open education, but it is so important in terms of epistemological privilege And then Rima, the creativity and the artistic ... Each of those aspects of pushing the disciplinary boundaries and forcing me to think about new applications has been a really important takeaway.

The transformative exposure Kathryn describes effectively breaks us out of disciplinary silos and expands our academic horizons. Saudia confirms this transformation when she states, “I think I was having a bit of tunnel vision with my own career before I came to this group. So that was a huge gain for me”. The interpersonal aspect amplifies the learning, creating not only intellectual growth but also deep appreciation for each other’s achievements. Appreciation that manifests in our consistent practice of celebrating both major milestones and incremental progress throughout our shared journey.

Celebration and recognition: Honoring the journey

The hallmark of our WW interactions has been a culture of authentic celebration that recognizes both major milestones and micro-achievements throughout our doctoral journeys. These celebrations extend far beyond perfunctory congratulations to become meaningful acknowledgments of struggle, perseverance, and accomplishments that go unnoticed by those outside our academic community.

The uniqueness of our understanding of each other’s experiences makes our celebrations particularly precious. Emphasizing this aspect, Mae exclaims:

You did something, but who's going to care? Or even understand? Or even remotely comprehend what it meant? So, every time we accomplished something, there was that round of applause, and you knew it was the real deal. It wasn't just somebody on social media throwing you a little check or something. It was heartfelt.

Similarly to Mae, Rima treasures the intimate moments of breakthrough recognition: “those tiny little celebratory things each time we had a breakthrough, I think that was the highlight of my participation in the library”. To illustrate this with an example, Rima recounts:

When I wrote my first poem, and I was super excited about it... I don't know if I could share it with anybody else. I don't think I could. But just having one of you with me in the library at the moment and being able to say, “Hey, do you want to see what I wrote?” and get that, “Wow, that is fantastic!”

In addition to celebrating small victories, it has become customary for us to dedicate time for multiple rehearsal sessions with each other before our oral defenses, then organize virtual parties immediately following each person's defense to celebrate the success of such a major milestone. Chadia describes these pivotal moments:

The ones that stood out a lot... is then when we prepare for, you know, the candidacy defense, when everyone is rehearsing... It's like every rehearsal feels like you are wholeheartedly there for that person... And then attending the defense, whether for the candidacy or the final defense, was just, I don't know. I cannot explain it.

These moments that Chadia struggles to articulate remain deeply memorable and impactful in each of our experiences, particularly because they represent the culmination of years of shared struggle and mutual support. Mae captures their significance, providing a vivid recount of her own defense experience:

One that brought me to tears many times is my dissertation exam, my defense exam, because one I had Margaret. Margaret's beautiful home, not far away from where she's standing right now, and that sense of being surrounded and compassed and saturated by love and support and respect was through that gift, and then to see Chadia here with [her baby] on the video watching me; just all the congratulations and everything was so important to me.

Mae's heartfelt recollection highlights how our celebrations are not mere parties, but rather lasting memories of love, support, and collective triumph that surpass the academic accomplishment itself. These experiences of authentic recognition and celebration become enduring gifts that we carry forward into our professional lives beyond the doctorate.

Professional Identity Development Beyond the Doctorate

Our WW experience shapes our identities and practices as educators, scholars, and professionals. The relationships, skills, and perspectives we develop through our collaborative journey during our doctoral studies and beyond become integral to how we approach our post-doctoral careers. To describe the ongoing professional value of our network, Rima notes: *"It gave me a good network of people; I know that I can lean on any one of you if I need you to come and give a keynote, or I can invite you to a conference"*.

Beyond networking, the supervisory and mentoring skills we develop through peer support prepare us for future academic roles. Kathryn reflects:

It seems like we unintentionally cultivated our own supervisory skills for when we work with our own graduate students in the future. We did that with the support of each other, and we also did that by learning about how each person was navigating their own dissertation committee dynamics and difficulties and challenges and successes.

These skills that Kathryn describes become essential to our effectiveness as academic leaders and mentors. Furthermore, our commitment to advancing scholarship continues through our dedication to sharing our experience with the broader academic community. This collaborative autoethnography represents our ongoing commitment to contributing knowledge that can benefit other doctoral students and educational institutions offering online graduate studies.

DISCUSSION AND CONCLUSION

The eight interconnected themes that emerged from this collaborative autoethnographic study suggest that innovation in doctoral education stems not from technological sophistication but from the intentional cultivation of reciprocal relationships grounded in the Indigenous concept of *ako*. As Brown et al. (2010) observe:

Modern communication tools, and more specifically those tools that can be regarded as collaboration technology hold plenty of potential to be useful in collaborations of academics...to assist two or more people to work together (...) at different places or different times. (p.11)

Our experience validates this potential, revealing that innovation lies not in our digital tools but in how we used them to create meaningful academic and personal relationships through commitment, vulnerability, and shared purpose - transforming ordinary platforms into extraordinary communities.

The community we have created through our online academic sisterhood continues to this day, redefining possibilities for lifelong scholarly connection as we transition from student lives into our professional and family roles. Our collective doctoral journey illustrates how distance education, when enhanced by learner-initiated communities grounded in reciprocity and care, can challenge fundamental assumptions about academic isolation. When we opened our vulnerable selves to others across digital spaces, we discovered that distance matters less when we give and receive genuine support, creating bonds that persist beyond formal academic requirements.

Our WW group stands as evidence that the most profound educational innovations occur when human connection and intentional care converge across any distance. Without doubt, we will continue to hold each other in our hearts, and when one reaches out and says, "I need help!", another will be quick to respond.

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In-service Teacher Education Assessment Literacy: Deconstructing Distance Education Students' Perceptions

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ABSTRACT

Student assessment in blended distance learning has transitioned away from paper-based assessment, even in emerging economies. This is especially true after the worldwide COVID-19 pandemic. Through purposive sampling, this study investigates the assessment literacy of 308 in-service teachers registered at an institution to upgrade their qualifications. The purpose of the study is to enhance programme learning design and development. Due to the concerns around learner assessment in basic education in South Africa, this study investigates how participants' on-the-job experience of learner assessment might impact their perceptions of assessment in their studies and vice versa. The Critical Pedagogy Theory (CPT) assists in probing the tensions and resonances that exist between the two spaces (i.e. classroom teaching and participants' experience as students), and pedagogy and technology, the latter being central to 21st-century assessment. The study adopts sequential explanatory mixed methods: data are collected through relevant institutional documents, an online Google Form survey, a one-on-one interview, and an online focus group discussion. Data analysis involves descriptive statistics and thematic analysis. Findings indicate there is more to be done on teacher assessment literacy, while there is room for improvement by the institution on its assessment practices. Recommendations include the need for contextualised training on assessment literacy for teachers and the integration of initial teachers' training and further professional development on assessment guided by CPT tenets. Lastly, the study will add to empirical studies, where literature indicates a paucity of research guided by CPT in the field assessment.

Keywords

distance education; student/learner assessment; assessment as learning; assessment for learning; assessment of learning; assessment literacy; teacher education; in-service teachers; perceptions; critical pedagogy theory

This paper is published in full elsewhere.

Exploring 2D Metaverse Platforms at the Open University of Japan

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ABSTRACT

In the history of distance education, learner isolation and the lack of peer interaction have always been persistent challenges, often leading to decreased motivation and higher dropout rates. The widespread adoption of synchronous web conferencing tools such as Zoom, Google Meet, and Microsoft Teams has alleviated these issues to some extent. However, these platforms lack the informal learning environments and spontaneous social interactions that naturally occur on physical campuses. 2D metaverse platforms provide virtual spaces where students can engage in extracurricular and social activities, fostering informal interactions essential for enriching student life and learning experiences. At the Open University of Japan, physical study centers in each prefecture have traditionally served as hubs for such interactions. While beneficial for those who can visit in person, these spaces remain inaccessible to students with time or mobility constraints, limiting opportunities for spontaneous engagement. 2D metaverse platforms, also known as proximity-based video conferencing systems, replicate aspects of physical environment by allowing students to control avatars and interact via video, audio, and text. These platforms create dynamic virtual spaces for both social and academic engagement. This paper presents case studies from a trial implementation of a 2D metaverse for extracurricular activities at the Open University of Japan. It also explores key challenges and design considerations for effectively leveraging 2D metaverse platforms to build learning communities in distance education.

Keywords

Distance education, learner isolation, synchronous tools, web conferencing, spontaneous social interactions, 2D metaverse, informal interactions, proximity-based video conferencing, avatars, learning communities

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INTRODUCTION

Distance education has long been accompanied by the challenges of learner isolation and limited peer interaction; factors that significantly impact student motivation, engagement, and retention. While the expansion of digital technologies has provided new tools to bridge these gaps, the core issue of fostering meaningful, informal social interaction among distance learners remains unresolved. In particular, the absence of spontaneous peer-to-peer engagement, commonly experienced in traditional campus settings, continues to affect the quality of student experience in online education.

The emergence of synchronous web conferencing tools such as Zoom, Microsoft Teams, and Google Meet has enabled more immediate and interactive forms of communication between instructors and students. These platforms were especially valuable during the COVID-19 pandemic, supporting the rapid shift from in-person to remote teaching. However, such tools are primarily designed for structured, instructor-led sessions and do not adequately support the informal, unstructured interactions that often occur before, after, or between classes on a physical campus. These moments—shared discussions, peer advice, collaborative study, or casual conversation—play a crucial role in creating a sense of belonging and learning community.

At the Open University of Japan (OUJ), which serves a large and geographically dispersed student population, physical study centers in each prefecture have historically functioned as hubs for student interaction and community building. While these centers are beneficial for learners who can access them regularly, they remain out of reach for many—particularly those with work, caregiving, or mobility constraints. As a result, there is a growing need to explore alternative environments that can foster informal social engagement in a more accessible and flexible way.

This paper explores the potential of 2D metaverse platforms, also referred to as proximity-based video conferencing systems, as virtual spaces for extracurricular and social interaction. These platforms simulate physical environments by allowing users to control avatars and interact through video, audio, or text when in close proximity to others, mimicking real-life conversational dynamics. Drawing on case studies from a trial implementation at OUJ, this paper examines how such platforms can enhance student engagement, promote a sense of community, and address longstanding challenges in distance education. Additionally, it discusses design considerations and practical implications for integrating 2D metaverse environments into the broader landscape of online learning.

LITERATURE

Distance Education Challenges

In distance education, students tend to feel they are learning alone without peers, and the absence of non-verbal cues and spontaneous interactions can lead to feelings of disconnection. Research on social presence in distance education consistently highlights its importance for student engagement, satisfaction, and learning outcomes. Reduced social presence, where students feel disconnected from peers or instructors, can negatively impact these outcomes. Perez (2013) found that fostering social presence through mutual care, emotional attachment, and open communication reduced student isolation and helped with course retention. In addition, social presence enhances peer-to-peer learning and discussion participation in virtual learning teams (Topchyan, 2016; Weaver & Albion, 2005).

While peer interaction is theoretically valued in distance education, it is frequently limited by logistical, technological, and motivational barriers—requiring thoughtful instructional design and support to be effective. Papi et al. (2019) conducted a systematic review of 60 studies and found that while peer collaboration is beneficial, many learners avoid it to maintain flexible schedules, reducing peer communication opportunities. Ferguson (2010) interviewed students at the Open University and revealed that while courses aimed to promote peer interaction, students often faced emotional and practical difficulties in online group work, such as challenges in self-presentation and social discomfort.

In addition to reduced social presence and limited peer interaction, weakened sense of community is another persistent challenge in distance education, contributing to learner isolation and attrition. A study by Rovai and Lucking (2003) compared traditional and television-based courses and found that students in distance settings, including those physically present in studio settings, experienced a significantly weaker sense of classroom community than face-to-face learners. Moore (2014) states that the inherent structure of distance education creates barriers to interpersonal connections, necessitating intentional strategies to foster community.

Due to those limitations discussed above, motivational decline is a common issue in distance education, driven by factors like social isolation, lack of feedback, unengaging content, and reduced autonomy, requiring thoughtful instructional design to mitigate. Factors such as age, gender, employment, and marital status also influence motivation in distance learners, with some groups experiencing greater motivational decline (Omeroglu & Kelesoglu, 2020).

The motivational decline can lead to dropout and attrition and distance education has consistently higher dropout and attrition rates than traditional education. Gomez and Bocarnea (2009) have found dropout rates in distance courses are often 10–20% higher than in-person courses, reaching 30–50% in some programs. Dropout is more evident among first-time online learners who often experience cognitive overload and weak motivation, leading to dropout within the first few weeks (Tyler-Smith, 2006).

The Role of Study Centers

Distance educational institutions usually provide study centers that play a vital role in bridging the gap between learners and institutions, providing academic support, social connection, and technological assistance though their effectiveness depends on resources, coordination, and adaptation to digital demands. The study by Kember and Dekkers (1987) show that students highly value academic support provided through study centers, particularly when focused on clarifying learning difficulties and tutor-led sessions.

Though study centers play crucial roles in many distance education institutions, coordinators at those study centers often face delays in materials, limited facilities, and poor communication with central institutions, which negatively impacting service quality (Owusu-Mensah et al., 2015). In addition, the cost of maintaining multiple study centers is increasingly becoming costly and adaptation is required in the digital age. Bernath, et al. (2003) reported on developments in study centers in Germany and identified unique challenges in establishing open and distance study centers in the electronic age, highlighting the need for cultural and institutional adaptations.

The Open University of Japan (OUJ) has 50 study centers that provide following functions:

- Academic support hubs: providing face-to-face classes and academic advising;
- Administrative supports units: assisting students with enrollment, document submission, and other support services;
- Support for non-traditional learners: creating safe and inclusive spaces for diverse student populations;
- Learning resource centers: providing physical and digital libraries to enable students to engage in self-directed learning;
- Social and community spaces: serving as venues for informal interactions, extra-curricular activities, events, and study groups; and
- Local outreach: serving as the regional face by collaborating with local organizations, employers and governments.

Currently the functions of those study centers are under review by the committee, and the structure of study centers may be fundamentally transformed in the near future.

Learning Commons

The concept of the learning commons emerged in the 2000s as an evolution of the "information commons" model from the 1990s. While information commons primarily focused on providing access to digital resources and technology workstations, learning commons expanded this to encompass a broader range of services and a more explicit focus on active, social learning and knowledge creation. It reflects a shift in educational philosophy towards more student-centered, inquiry-based, and collaborative pedagogies. A learning commons is a flexible and technology-rich space that integrates various resources and services to support diverse learning styles and needs. It moves beyond the idea of a library as simply a place for quiet individual study and book borrowing, transforming it into a vibrant hub for interaction, creation, and knowledge sharing.

The virtual extension and enhancement of a physical learning commons is a "digital learning commons" or "virtual learning commons." It leverages digital tools, platforms, and resources to create an accessible, collaborative, and rich learning environment that transcends the limitations of physical space and time. It is an interactive hub designed to replicate and expand upon the functions of a physical commons in the digital realm.

A case study from a South African institution evaluated the implementation of a digital learning commons, emphasizing the need to train librarians and integrate pedagogic, andragogic, and heutagogic frameworks to improve service delivery in distance learning contexts (Van Wyk & Kadzenga, 2017). Ren and Cao (2010) proposed a semantic-based model for a Virtual Learning Commons (VLC), showing how digital libraries, e-learning systems, and social networks can be combined to create a multi-layered support environment for learners.

Metaverse in Education

The metaverse offers promising innovations for distance education, such as immersive collaboration, greater interactivity, and improved inclusivity. A rapid review by Damasceno et al. (2023) has found that virtual metaverse environments have potential to support inclusive distance learning, but challenges like technical complexity and system performance must be addressed. Another review by Abraham et al. (2023) discussed how the metaverse supports simulations, collaborative projects, and

access to digital resources, offering a classroom-like experience in virtual settings. Cukurbasi, Sabuncu, & Altun (2022) also found metaverse environments facilitate active participation, emotional connection, and social interaction and addressed limitations in traditional e-learning formats. Structured reviews by Chamola, et al. (2025) stress that while the metaverse enables customized and immersive learning, ethical concerns, cost, and accessibility are barriers to widespread adoption

METHODS

In October 2023, we initiated an internal research project to evaluate the feasibility of using a 2D metaverse platform for students' extracurricular activities and self-study sessions facilitated by tutors. We reviewed several 2D metaverse platforms available in Japanese, assessing factors such as cost, user capacity, bandwidth and computer specifications, support availability, and user-friendliness. Ultimately, FAMcampus by Fuji Soft was chosen for the trial. It is a map-based environment in which users navigate a 2D virtual campus by moving avatars on a floorplan-style map. Participants appear as avatars, which can be moved freely across the space, and audio and/or video is activated when avatars come near each other, simulating natural social encounters. It also includes public and private messaging to enhance communication flexibility.

One of the initial challenges we faced involved integrating the platform with our existing Single Sign-On (SSO) system. This integration is crucial to allow students seamless access without needing to log in multiple times, and to simplify account management for administrators. In March 2025, the 2D metaverse (from now on we will call it the virtual learning commons, VLC), the VLC was finally integrated with the SSO system through Shibboleth and SAML authentication.

In a meantime, customization was also made to make it possible for users to change the display name on VLC as it was a common demand by students who do not wish to disclose their real name that was the default name displayed under the user's own avatar. The room reservation system was created so that users can book a room and set up a link to a web conferencing system such as Zoom and Google Meet in advance.

Between August 2024 to March 2025, the following activities were initiated on the VLC:

- Graduate student informal interaction in online courses: This includes students enrolled in the eLearning Theories and Practices (79 students), and Information and Communication (64 students) courses for the first semester of 2024. A total of nine out of 143 students expressed their interest in participating in two virtual meet-up sessions scheduled for 16:00 on September 4 and 5. Out of the nine people who expressed their interest in participating in the virtual sessions, five people actually participated in the sessions.
- Oversea student informal interaction: Approximately 100 students taking courses from abroad, with seven volunteering for a virtual meet-up session. These participants include two from Poland, two from Germany, one from Argentina, one from the USA, and one from Sweden.
- Online self-study groups: These are student-led groups that engage in regular Zoom meetings to practice and study English outside of class time, under the guidance of teaching fellows.
- Student support group leaders' meetings: Leaders from various student support groups spread across different study centers nationwide. Previously, they lacked a platform for regular information exchange.

- Live Web class participants interaction: Students who are enrolled in the Live Web class on Online Research Practices, which are synchronous classes conducted via Zoom.
- Extracurricular student group gatherings: Those students who belong to English conversation club, hand-craft hobby groups, etc. gathered on VLC to meet.

DATA COLLECTION AND RESULTS

A questionnaire consisting of 16 set of questions was created using Google Forms. An email invitation to participate in the online survey was sent to a total of 120 email addresses listed in the user database of OUI Virtual Learning Commons (VLC). Out of the 120 recipients, 40 responded, resulting in a response rate of 33%.

The first question asked whether respondents had prior experience using other metaverse platforms. Twenty-eight out of the 40 respondents (66.7%) indicated that they had used other metaverse platforms before accessing the OUI VLC. The platforms mentioned included Fortnite, Discord, Second Life, Gather.town, Spatial, Cluster, oVice, VRChat, and REV WORLDS. Among these, Fortnite, Second Life, Spatial, Cluster, VRChat, and REV WORLDS are considered 3D metaverse platforms. In contrast, Gather.town and oVice fall under the category of 2D metaverse like FAMcampus. Discord, while frequently used for community engagement in metaverse contexts, is primarily a communication tool rather than a metaverse platform itself.

Although the VLC system became available in July 2024, only nine out of the 40 respondents requested access before October 2024, with an additional 12 registering after January 2025. The trial launch of the VLC was communicated informally, primarily through word of mouth. This limited approach was taken to avoid a rapid influx of users that might exceed the communication capacity stipulated in the contract with Fuji Soft.

Regarding usage frequency, nine participants reported accessing the VLC more than 10 times, while another nine accessed it between six and nine times. Eleven respondents accessed the platform only once or twice. Although initially it was expected that the availability of such a platform would attract widespread engagement, the findings suggest that without intentionally organized activities, increasing usage proved to be a challenge.

As for the purposes of VLC usage, the most common was participation in colloquia, cited by 46% of respondents. These colloquia were informal sessions regularly organized by a faculty member teaching English, aimed at supporting students' English learning outside of formal coursework. The second most common purpose, reported by 39%, was attending meetings. Some project-related meetings were intentionally held on the VLC to promote platform usage and allow participants to gain firsthand experience. Additionally, 14 respondents indicated that they accessed the VLC out of curiosity, while 12 mentioned using it to participate in extracurricular activities.

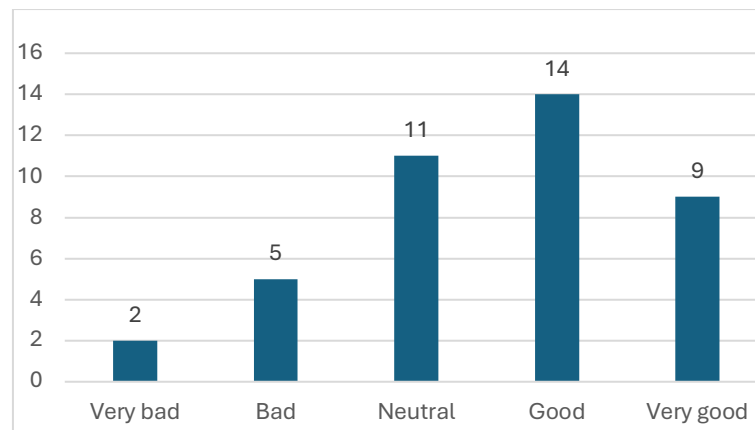


Figure 1. First impression of the VLC © The Author.

Regarding first impressions of using the VLC, nine respondents (22%) rated it as “very good” and 14 (34%) as “good.” In contrast, five respondents (12%) rated it as “bad.” And two (5%) as “very bad.” Positive impressions were attributed to several factors, including the ability to communicate beyond physical limitations, a stronger sense of connection compared to traditional video or audio-only platforms, a feeling of being “present” with others, and the opportunity for two-way interaction that extended beyond what Zoom typically offers. Some negative impressions appeared to stem from comparisons with 3D metaverse platforms or more familiar web conferencing tools like Zoom. “One participant commented that:

The screen is flat, so I don't feel the necessity of it being a metaverse. Camera and audio functions for calls are harder to use than Zoom, so I end up thinking Zoom is better. Other features like bulletin boards, chat, whiteboards, screen sharing also feel less user-friendly compared to widely used social media and services like Zoom or Discord.

No bulletin board. No record-keeping. Difficult to converse with others. Poor operability. Avatars aren't cute, etc.

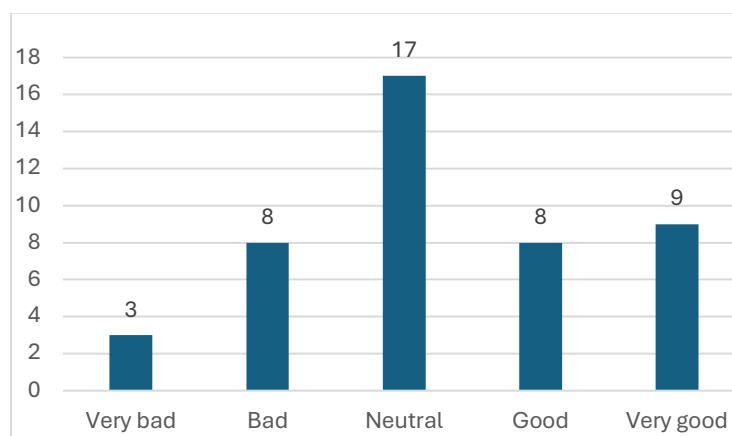


Figure 2. Ease of use of the VLC © The Author

As for the ease of use of the VLC, the majority of respondents expressed a neutral opinion, with 17 participants (41.5%) indicating it was neither good nor bad. An equal number of respondents, eight each, rated the ease of use as “bad” and “good.” Positive feedback highlighted the intuitive interface and ease of understanding basic operations. On the other hand, negative comments pointed to

outdated features, cumbersome avatar controls, and a lack of clear guidance on what users were expected to do.

One key advantage of using 2D metaverse platforms is the ease with which spontaneous communication can occur among participants. To explore this aspect, the survey included a question asking whether respondents have used any communication tools to interact with other users on the VLC platform. Thirty-one respondents (75.6%) reported that they had engaged in communication with others. The most commonly used tools were external web conferencing applications (67.7%), followed by text chat features within the platform (48.4%). Among those who did not use any communication tools, the reasons cited included: 1) lack of familiarity with the tools, 2) social hesitation, 3) low platform activity, 4) time constraints, and 5) personal circumstances.

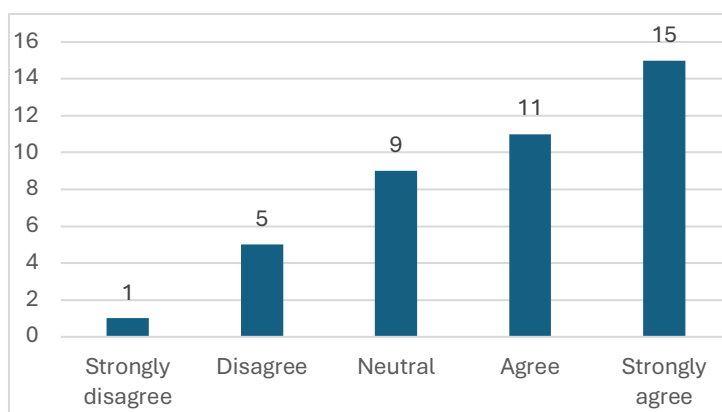


Figure 3. Intention to use in the future © The Author

In response to the question, “Would you like to use the platform in the future?”, 15 respondents (36.6%) answered “strongly agree,” and 11 (26.8%) responded “agree.” In contrast, five respondents indicated “disagree,” and one selected “strongly disagree.” Regarding overall satisfaction with the platform, seven respondents (17.1%) reported being “very satisfied,” and 17 (41.5%) indicated they were “satisfied.” On the other end of the spectrum, six respondents reported being “dissatisfied,” and one respondent reported being “strongly dissatisfied.”

Overall comments regarding the VLC platform can be categorized into the following four areas:

- **Strategic and conceptual observations:** Some respondents questioned the suitability of metaverse platforms for OUJ’s student population, noting that many students are older, mature learners and not part of the Gen Z demographic typically more comfortable with such technologies.
- **Usability and design feedback:** Several users reported difficulty distinguishing between interactive areas and background elements within the platform. Others described the visual design is overly childish and not well-suited to adult learners.
- **Feature requests:** Suggestions included adding a bulletin board-style function to facilitate communication, simplifying the user settings, allowing users to customize avatars with personal photos or favorite images, enabling smartphone access, and receiving notifications even when not actively using the platform.
- **Usage and capacity limitations:** Some users pointed out that the number of participants allowed on the platform at one time was too limited.

Finally, in response to the question, “What do you expect from the VLC in the future?” respondents provided a range of comments that can be grouped into three broad categories:

- **Expectations and vision for the platform’s role:** Several respondents expressed hopes that the VLC would foster more active student-led initiatives, such as club activities and independent study groups. Others wished for greater faculty involvement in the platform to support informal communication beyond formal coursework. One respondent, living in a rural area with a disability, expressed strong expectations for the VLC’s potential to facilitate horizontal connections among students and reduce the sense of isolation often associated with distance learning.
- **Feedback on current state and areas for improvement:** Some respondents offered critical feedback, pointing out that the platform currently lacks clear usage guidelines and essential features, which hinders its effectiveness and usability.
- **Feature requests and specific suggestions:** Respondents proposed a variety of enhancements, including improved record-keeping and user operability, expanded opportunities for informal interaction, and an increased number of available accounts to enable wider participation. Other suggestions included holding events and discussions in multiple virtual rooms, allowing users to create and host their own meeting spaces (e.g., casual weekend gatherings), and developing features that replicate the dynamics of face-to-face classes and region-transcending extracurricular activities.

CONCLUSION AND SUGGESTIONS

The literature consistently highlights the importance of social interaction in distance education, noting its role in reducing learner isolation and motivating students to persist in their studies. While it was initially hoped that simply providing a 2D metaverse platform would naturally foster student engagement and social interaction, the reality proved more complex. Attracting participation, particularly from distance learners who often juggle multiple commitments, was more challenging than anticipated. By nature, many distance education students are mature adults who have chosen this mode of learning precisely because their personal and professional obligations prevent them from attending on-campus programs.

Nevertheless, many students expressed appreciation for having a virtual place that facilitates informal interactions with both peers and faculty. However, such interactions do not occur spontaneously, contrary to the notion that “if you build it, they will come.” For a 2D metaverse platform to function effectively as a virtual learning commons, deliberate planning is essential. This includes organizing purposeful events and activities, as well as providing clear guidelines for participation to foster consistent and meaningful engagement.

On physical campuses, students are often present because they have specific reasons, such as attending classes or participating in extracurricular activities, which naturally create opportunities for spontaneous, informal interactions. While it is difficult to fully replicate these dynamics in a virtual environment, increasing the number and variety of organized events on the VLC platform can significantly enhance the chances of such informal interactions occurring organically among participants.

Another important consideration in operating a 2D metaverse platform as a virtual learning commons is cost. Most 2D metaverse platforms charge fees beyond a limited number of users,

requiring the university to plan for growth strategically. In this project, one of the key achievements was the successful integration of the platform with the university's single-sign on (SSO) system. This required resolving various security concerns and overcoming compatibility issues between authentication protocols. Once integrated, the platform became easily accessible to all students; however, concerns remained about exceeding the system's telecommunication capacity. As a result, user account growth has to be carefully managed.

Moreover, this initiative was funded through an internal research grant, and the long-term sustainability of its maintenance costs remains uncertain. Moving forward, a more robust and strategic allocation of resources will be necessary to support continued development and operation of the 2D metaverse as a permanent virtual learning commons for distance learners.

In conclusion, while the implementation of a 2D metaverse platform as a virtual learning commons presents promising possibilities for enhancing social interaction in distance education, its success depends on more than just technological availability. The trial at the Open University of Japan revealed both the potential and the limitations of such platforms. To truly foster a sense of community and reduce the isolation often experienced by distance learners, sustained institutional support, intentional community-building efforts, and thoughtful resource planning are essential.

Future efforts should focus not only on improving the technological infrastructure but also on embedding the platform into the broader educational and social fabric of the university. This includes aligning virtual spaces with academic calendars, offering faculty development to promote engagement, and gathering continuous feedback from users to guide iterative improvements. As distance education continues to evolve, the integration of immersive and interactive platforms like 2D metaverse environments will play an increasingly critical role in reimagining what it means to connect, collaborate, and learn—regardless of physical location.

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Development of a Novel Distance Taught University-based Training in EMDR Therapy

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ABSTRACT

This article outlines the use of distance education to deliver competence-based and culturally appropriate specialist training in Eye Movement Desensitisation and Reprocessing (EMDR) Therapy for mental health professionals in Aotearoa New Zealand. EMDR is a World Health Organization-endorsed evidence-based treatment for posttraumatic stress disorder, historically taught through North American training models that may lack relevance to local clinical and cultural contexts. We piloted two new “special topic” courses that embedded new EMDR teaching within a university framework. Key innovations included a novel competency framework, tailored teaching materials and evaluation processes, and a hybrid delivery model combining blocks of residential in-person training with synchronous online teaching. The papers provided proof of concept and were well subscribed and highly rated, such that they were accepted as permanent courses within a new postgraduate qualification. We discuss the challenges navigated, and outline a series of ongoing program evaluation studies, to provide a 360-degree evaluation framework for the training. This initiative offers a replicable model for clinical educators seeking to expand access to culturally responsive, evidence-based psychotherapeutic training through higher education pathways.

Keywords

EMDR; clinical training; distance learning; co-design; cultural responsiveness, tertiary education

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INTRODUCTION

Mental health disorders are both highly prevalent and significantly disabling, at least on par with a range of serious physical health conditions (Murray et al., 2020). The World Health Organization (WHO) estimates that one in eight people globally experience a diagnosable mental health condition (Global Health Data Exchange, GHDX). At the same time, these prevalence rates reveal disparities associated with sociodemographic factors, and it is noted that a substantial proportion of mental health difficulties are undetected and/or untreated (WHO, 2021). This is particularly concerning given that there exist a range of evidence-based pharmacological and psychological therapies for most mental health conditions (WHO, 2022).

Posttraumatic stress disorder (PTSD) is a distressing mental health condition, that develops after experiencing a traumatic event (American Psychiatric Association [APA], 2013, p.271). Traumatic event is defined as an experience including “exposure to actual or threatened death, serious injury, or sexual violence” (APA, 2013, p.271). PTSD is widespread across communities, with epidemiological research revealing that around 4% of the population would meet diagnostic criteria at least once in their lifetime (WHO, 2013). Symptoms such as intrusive flashbacks, nightmares, negative thoughts and feelings, and physical reactivity can have a severe impact on the functioning of individuals with PTSD (APA, 2013).

There are two psychological therapies which the WHO has identified as constituting best practice in the treatment of PTSD: cognitive behavioural therapy (CBT) and eye movement desensitisation and reprocessing (EMDR) therapy (WHO, 2013). EMDR has also been endorsed as an evidence-based intervention for PTSD by a range of professional associations and societies, and treatment guideline groups, from a broad range of countries (American Psychological Association [APA], 2025; International Society of Traumatic Stress Studies, 2020; National Institute for Health and Care Excellence, 2018; Phelps et al., 2022; Seedat, 2013). There is also research support for EMDR in the treatment of PTSD in children (De Jongh et al., 2019). Additional research evidence, in the form of randomised controlled trials and systematic reviews, has shown EMDR to be an effective treatment for a broad range of additional conditions in adults, including anxiety and mood disorders (Faretta & Farra, 2019; Scelles & Bulnes, 2021; Sepehry et al., 2021; Valiente-Gómez et al., 2017). Finally, there is additional research showing promising indications for the effectiveness of EMDR for PTSD in people with co-morbid psychotic conditions such as schizophrenia (Every-Palmer et al., 2024; Sin et al., 2017).

EMDR is a psychological therapy delivered by appropriately qualified and trained mental health professionals. The practice of EMDR incorporates a structured approach to therapy that helps people work through traumatic memories. It utilises protocols which start with an assessment process, in which a conceptualisation of the trauma is developed, followed by sessions where the person is asked to recall distressing experiences while engaging in saccadic eye movements (moving their eyes back and forth) which are guided by the therapist. This approach helps individuals replace distressing thoughts and feelings linked to trauma with more helpful constructive beliefs. By revisiting and working through these memories in a safe, guided way, clients engaging in the therapy are able to process and resolve the impact of the traumatic experience/s (Shapiro, 2018).

In New Zealand, and in many other countries, EMDR training has traditionally been offered through private providers affiliated with the North American EMDR International Association TM (EMDRIATM), which sets training standards and provides trainer accreditation processes. This training model, typically involving 20 hours of intensive course teaching instruction and at least 40 hours of supervised

clinical work, has been in place since the late 1990s with few developments over that period (Farrell & Keenan, 2013). While the intensive workshop model is convenient for busy practicing clinicians, there have been calls for new training models, that include different formats and pedagogies which move beyond the traditional short courses and incorporate asynchronous learning (Rydberg, 2024). Additional critique has focused on indicated high training dropout rates, and a lack of research on the fidelity of EMDR practice following training (Rydberg, 2024). Finally, the predominant current EMDR therapy training available in most countries is described as a “Basic Training”. As such, it may not prepare trainees adequately for the degree of complexity of mental health presentations commonly seen in both hospital and outpatient-based services internationally.

Additional concerns have been expressed about the relevance of the standard EMDR training to unique cultural contexts that occur across different countries and communities, given the indicated importance of cultural factors in client attunement (Bell et al., 2024; DiNardo & Marotta-Walters, 2019; Marich et al., 2020). The few studies which have examined cross-cultural applications of EMDR have found that adaptations, including in the content of materials and delivery formats, were essential to accommodate cultural differences (Carvalho & Hoersting, 2023; Mbazzi et al., 2021; Nickerson, 2022). This is consistent with evidence-based practice guidelines which emphasise the importance of accounting for context, including culture, in the provision of effective mental health care (Melchert et al., 2023). Moreover, this is a population health issue given that minority and indigenous cultures frequently experience disproportionately poor mental health outcomes (Wilson et al., 2022). Finally, critiques have also highlighted that many current training programmes lack the depth, academic rigour, and assessment standards typically found in university-led clinical education (Bell et al., 2024). Calls for university-based EMDR training, including competency-based assessments, date back over a decade (Farrell & Keenan, 2013), with more recent recommendations emphasising the need for a comprehensive, curriculum-based approach (Lalotitis et al., 2021), and identification of the core practice elements of EMDR Therapy (Hase, 2021). A related finding by Morrisson et al. (2023), noted that mental health practitioners tend to prefer to practice the therapies learnt in their foundation university training over those they have trained in following licensure/registration, with the authors concluding that modalities learnt at university can set clinical practice histories. While some universities have offered short courses, we are aware of only one— the University of Worcester in the United Kingdom — that has delivered a fully assessed academic programme in EMDR. Furthermore, there is limited research on how EMDR is taught to healthcare professionals (Marich, 2009; Miller, 2024), and what has been published producing mixed findings on trainees’ confidence in implementing EMDR (Collins et al., 2024, Leeds, 2009).

In summary, the literature on EMDR training has included calls for more research generally, with additional specific recommendations around the need for university courses in EMDR therapy, training in the treatment of more complex presentations, and the incorporation of culturally responsive practice in EMDR training (Carriere, 2014; Farrell & Keenan, 2013; Mehrotra, 2014; Miller, 2024; Nickerson, 2022). As mental health clinician-academics working in a university department with expertise in delivering postgraduate psychological therapy courses, we identified the need and the opportunity for such EMDR training locally. We had researched EMDR among forensic populations in New Zealand (Every-Palmer et al., 2023; Every-Palmer et al., 2024), and while we found it to be effective for treating PTSD, we observed that traditional EMDR training did not incorporate the cultural considerations of the populations we serve. In this context we created a novel university-delivered postgraduate training program in EMDR therapy at the University of Otago (Otago) in New Zealand.

This article outlines the development, implementation of the program, along with a joint evaluation project undertaken the University of Otago in partnership with Massey University. As outlined in the published evaluation protocol, our aim was to produce a nationally scaled, fit for purpose, culturally responsive and contextually relevant training program (Bell et al., 2024). We begin by reviewing the steps involved in creating the training courses, including (1) the development of a competency framework and teaching curriculum; (2) the integration of cultural and contextual factors; (3) the implementation of a stakeholder advisory group; and (4) the development of a hybrid in-person and online delivery mode. We then share the evaluation model and processes engaged in, before providing an overview of the results of the evaluation to date. We finish with a discussion of the evaluation findings, comparing our results with findings from relevant literature. We attempt to integrate reflections on our experiences developing, delivering and evaluating this novel university training initiative. We conclude with an overview of the challenges, lessons and achievements arising from the project, along with acknowledgments regarding the limitations of the evaluation, and a summary of the potential impacts and contributions of this initiative.

STEPS IN THE DESIGN AND IMPLEMENTATION OF THE TRAINING

To proceed with developing the training, our group was first required to apply through the Otago's internal administrative processes to deliver the requisite papers (courses). These processes focus on ensuring that there is reasonable justification for the proposal, including evidence for demand and alignment with the University's strategic directions. The application process included consultation with key stakeholders, including students and the regulatory authorities for professions whose registrants were eligible to undertake the training. Formal proposals applications were then submitted through various committees, boards, governance groups, and finally to an external national quality assurance agency for universities, with this process taking approximately 18 months from late 2021. We were ultimately successful in an application to deliver two "special topic" papers. At Otago's special topics are one-off courses that can be used as pilot or "tester" courses to gauge interest in an area to consider their sustainability as future permanent offerings. The two full-year part-time papers comprising the pilot training were:

- Special Topic I (ST1) – An introductory paper which was delivered for the first time in 2023. It provided trainees with a comprehensive grounding in EMDR theory, and in the applied practice of EMDR therapy, with a focus on PTSD.
- Special Topic II (ST2) - An Advanced Topics which was delivered in 2024 alongside a repeated offering of Special Topic I. The Advanced Topics course covered more advanced theory and practice, including treating complex trauma presentations; treating phobic, obsessive compulsive, panic, abnormal grief, and addiction disorders; delivering EMDR for trauma symptoms in clients with severe mental illnesses (e.g. psychotic conditions like schizophrenia, and bipolar disorders like manic depression) who have co-morbid trauma related symptoms; and finally the delivery of EMDR therapy in groups.

Only one course could be taken at a time, with ST1 being a prerequisite for enrolment in ST2. Each course had a university credit value of 30-points within Otago's academic workload coding system. This translates to 360 hours total work, or an average of 10 hours per week across the academic year.

Development of a Competency Framework

Concurrent with the applications to offer the papers, the papers themselves were developed, so they were ready to market and deliver once all approvals had been obtained. An essential starting point was the development of a competency framework to inform the curriculum and assessment processes. We developed an EMDR-specific competency framework drawing on principles from the CanMEDS approach to competency measurement (Frank et al., 2015). The CanMEDS method, which has its roots in medical education and physician training, allows for the operationalisation of the abilities required in all relevant domains of the specified area of practice. The CanMEDS approach has been widely used, including in medical, nursing and allied health professionals' training across more than 50 jurisdictions (Thoma et al., 2023). It also enabled the competency framework that was developed to include within the seven CanMEDS domains, competencies related to both (a) the fidelity to the technical application of EMDR-specific interventions, and (b) more generic therapeutic skills (e.g. relating to building trust and strengthening the therapeutic relationship). Competencies were evaluated using recommended psychometric measures (Adams et al., 2020), including EMDR Fidelity Rating Scale (EFRS, Korn et al., 2017), along with our own scoring frameworks that were integrated into course assignments. The full competency framework is published in Bell et al. (2024).

Development of a Teaching Curriculum and Assessment Framework

The development of the course itself was informed by three intersecting considerations. Firstly, the identified unmet EMDR training needs as outlined in the review of the international literature, secondly the prior EMDR practice and training experiences in New Zealand of the course convenor and other course trainers (who found previous training inadequate for their work), and finally the university requirements articulated in the special topics' application processes.

As outlined above, the relevant calls from the literature pertaining to the development of the training included the adoption of a university long course (full year) model allowing for more extensive coverage of topics, asynchronous learning, and formal assessment processes, with content including cultural factors and more complex clinical presentations.

University regulations stipulated that a range of requirements be met for the proposed course content and delivery process to be approved. These included the requirement to identify formal learning outcomes (aims and objectives), and the alignment of these with assessment procedures, terms requirements, and the University "graduate student profile". The graduate student profile outlines the attributes, skills, and values it promotes for its graduates. In the Otago's case for the EMDR training this included having global and interdisciplinary perspectives; information and environmental literacy; written and oral communication skills; self-motivation; and an appreciation of culture, critical thinking, scholarship, research, ethics, teamwork and lifelong learning. Finally, it was required that workload expectations for students and staff be specified, with these needing to align with university formulas for full year part-time graduate coursework. Assessment processes included formative and summative assignments focused on video recorded observed clinical practice, case-based discussions in supervision, written case conceptualisations, and a final viva voce in person examination. (See Bell et al. (2024) for detailed descriptions of the courses aims and objectives, learning outcomes, teaching and learning approaches, supervision program, terms requirements, student eligibility, and assessment procedures.)

Addressing Cultural and Contextual Responsivity

In New Zealand the Treaty of Waitangi/Te Tiriti o Waitangi is the founding document which in 1840 mapped out relationships between the indigenous Māori population and the colonising British Crown. All New Zealanders have obligations under Te Tiriti to ensure equitable outcomes for Māori. This is particularly important for mental health educators and practitioners, as Māori have elevated rates of poor mental health outcomes (Oakley-Brown, Wells, & Scott, 2006). An important contextual factor is the traumatic impact on Māori of colonisation, and the associated trauma of displacement, marginalisation, discrimination, and racism, which may have intergenerational effects (Pihama et al., 2017; Pitama et al., 2017). The potential impacts of historical trauma and minority stress may also be associated with findings from international research identifying higher prevalence rates of PTSD in racial and ethnic minorities (Asnaani & Hall-Clark, 2017), sexual minorities (Marchi et al., 2023), and migrants (Bustamante et al., 2017). This literature points to the importance of our training program advancing culturally responsive EMDR practice. To ensure culturally appropriate content to the course, ongoing advice was taken from a culturally diverse stakeholder advisory group (see below), indigenous Māori and Pasifika EMDR practitioners and Māori students attending the course.

Appointing a Stakeholder Advisory Group

To progress cultural and contextual responsivity, we wanted to move beyond consultation with relevant groups to involving stakeholders more actively in our processes. With regard to cultural issues, this commitment was consistent with calls from EMDR practitioners in New Zealand for training programs to partner with Māori to bring a bicultural lens to curricula (Clare, 2024). A programme Stakeholder Advisory Group was set up in 2023 in keeping with this more genuine partnership approach. This group included clinicians, health service leaders, university staff, and service users. Stakeholder Advisory Group members had expertise in EMDR practice, clinical teaching, service delivery, and an understanding of the needs of a range of marginalised and minority groups including Māori, Pasifika, and Rainbow communities, with some also having their own experience of EMDR treatment. The group provided vital perspectives on the unique cultural and clinical practice issues relevant to the New Zealand context. The group met approximately monthly during the academic years of 2023 and 2022 (the first and second year of course with a brief of providing advice into the programme delivery and evaluation).

Selecting a Distance Teaching Delivery Model

EMDR training has not been part of the foundation training of any of the mental health professions. It is during this foundation training when people are most likely to be full-time trainees in their discipline. Historically, EMDR training has therefore needed to be practically suitable for busy already registered/licenced practicing clinicians. This has led to the popularity of the intensive short course model. A challenge for our training program was to make use of the university long course format to provide the benefits of graduated accumulation and consolidation of knowledge and skills for students employed in at least half-time clinical roles.

This student context allowed us to incorporate the work integrated learning model (Ferns et al., 2022), in which students accessed clients (patients) from their clinical roles to gain experience with at their workplace setting with appropriate supervision. The work integrated learning model provided an experiential learning approach, integrating theory and practice, and encouraging lifelong learning. In

the health setting this involves a partnership between the educational institution, the student, and their clinical workplace setting (Stade et al., 2023).

Training students in psychological therapies is complex and focuses on sensitive and emotionally evocative material. While training that is solely delivered by e-learning may increase scalability and flexibility, the little research that has examined this approach indicates that it may not be optimal for psychological therapies, particularly those involving more complex interventions, such as treatments for trauma (Frank et al., 2020). Moreover, while there is a small amount of research indicating that e-learning can provide positive learning outcomes (Mikkonen et al., 2024), studies have also suggested that psychotherapy students find in-person training more engaging and more satisfying (Baumann et al., 2023; Mallonee et al., 2018).

We chose to deliver the training using a hybrid model of both in-person and online distance learning formats. This allowed us to promote engagement, to optimise learning by including elements of asynchronous activities, and to make training available to students nationally. The distance teaching involved the integration of in-person block-course teaching and web-based teaching, independent self-directed study, and group supervision. The in-person teaching involved two four-day blocks (one in each semester) comprising 32 hours per block of in-person teaching held at Otago's Wellington campus. This teaching could have been delivered via online video conferencing if COVID-related travel restrictions were in place. Each 2½ -day teaching and learning block included self-directed study tasks and skills practice (including self-experience) linked to modules of specified teaching and learning content. Lectures built on pre-reading (provided prior to each in-person teaching block), to expand understanding of EMDR, introduce treatment protocols, and set up practice of these during afternoon practicum sessions. Practicums required that trainees prepared a personal issue that they could work on during these sessions. The practicums gave trainees the opportunity to both practice the specific therapy techniques in pairs, and to have a personal experience of EMDR therapy. Additional teaching webinars were used to teach some theoretical components of the therapy. Students were required to attend at least 10 hours of small group training supervision (either in person or online) with an accredited EMDR trainer, in addition to their own personal clinical supervision that was part of their role as a mental health professional. Students were required to undertake six hours per week of self-study, outside of the formal teaching and supervision, involving independent learning and clinical practice for the duration of the course. Lectures were recorded and available for students in this context (any references to actual clients, both verbal and when shown on videos were deleted from those recordings). Self-study included completing set pre-reading. Students were also encouraged to set up their own peer support groups either in person or online.

EVALUATION

We aimed to comprehensively assess the impact of our novel university-based training course by undertaking a proof-of-concept determination; engaging in a co-design process with the Stakeholder Advisory Group to inform survey evaluation areas; evaluating the new competency framework and student assignment outcomes; and by completing a 360-degree evaluation of the experiences of teachers, trainees, stakeholders, and the patients treated by trainees.

Ethical Approval and Consent

All component studies for this evaluation research project were approved by the University of Otago and/or Massey University Human Ethics Committees in New Zealand. Ethics applications included

consultation with relevant Māori stakeholder groups. All participants in the studies provided written informed consent.

Evaluation Research Design

The evaluation project used a mixed methods design integrating both qualitative and quantitative research strategies (Combs & Onwuegbuzie, 2010). The mixed methods approach enabled us to seek a richer understanding of the impact of the training program by incorporating objective and subjective outcomes (Onwuegbuzie & Combs, 2011), along with providing the potential for triangulation through data convergence across methodologies (Boet et al., 2012; McChesney, 2020).

Study 1: Proof of Concept

Study 1 constituted the proof-of-concept evaluation, examining the initial feasibility of delivering university-based clinical training on a national scale. This was assessed by course uptake (determined by enrolment numbers) and the course completion rate. We estimated that each course (ST1 and ST2) would secure 20–30 enrolments, and that completion rate would be around 85% based on the low attrition rates found in survey data on comparable graduate courses (Michalski et al., 2016). Enrolments and completion rates were above expected levels for all offerings, as shown in Table 1. These results provided proof-of-concept evidence which led to a successful application for the ST1 and ST2 to become permanent credit-bearing courses contributing to a new Postgraduate Certificate in Health Science (with an EMDR Therapy Endorsement) qualification from 2026.

Table 1. Enrolment and Retention Rates for Special Topics Course Offerings

Course	Year of Offering	Enrolments	Completions (%)
Special Topics 1	2023	31	31 (100%)
Special Topics 1	2024	20	19 (95%)
Special Topics 2	2024	24	23 (95%)
Total		75	

Study 2: Partnering With Community Stakeholders to Co-Design Evaluation Outcomes

Mansoor et al., (2025) completed a co-design project, in which members of the research team partnered with our Stakeholder Advisory Group to identify key evaluation areas for the training courses. The aim of this study was to ensure the relevance of outcomes to the community in the New Zealand context. The study was informed by co-design philosophy and the Hautū Waka methodology. Hautū incorporates an indigenous knowledge system as a tool for plotting a course through multifaceted systems such as education (Taniwha-Pao et al., 2025). This involved moving through stages from selecting key areas to deciding outcomes. The primary results from this study included direct advice around course improvement, and the development of student survey measures focusing on what trainees experienced as the key barriers and facilitators to their engagement and completion of the course. For example, trainees reported high confidence with continuing EMDR practice following the course while identifying barriers around accessing supervision. Mixed results on trainees reporting of confidence practicing EMDR in a culturally responsive manner has informed ongoing programme development from the learning environment, for instance more time has been made available for students to connect with each other during teaching to content via including more diverse cultural

perspectives. Overall, 100% of trainees surveyed in 2023 reported the teaching as very good or excellent and the learning experience as valuable.

Study 3: Content Analysis of Assignment Feedback

Jardine et al. (2025) used content analysis of written feedback provided to students for the three assignment types, both at the formative and summative stages, to assess the competency evaluation framework and student development over time. The study found that most competencies – both the broader ('generic/systemic') and EMDR-specific ('technical') competencies – were addressed by the assignments. Those competencies that were not addressed by the assignments were evaluated in the final oral viva examination, leading us to conclude that the course assessment framework provided a valid approach to EMDR competency evaluation. Finally, it was observed that student competency increased over time with formative to summative grades increasing by 10%. This equates to two “letter grades” (e.g. B to A-) in the Otago grade point system.

Study 4: Educator and Trainee Experiences

Volkova et al. (2025) examined the experiences of students undertaking the courses and educators delivering the courses using Thomas’ (2006) general inductive approach. The authors’ qualitative analysis of individual and focus group interviews found that participants had predominantly positive experiences of the training. Considerable actionable feedback was derived including the need for emotional safety in practicums, the value of peer connection and supplementary supervision, and the importance of integrating cultural responsiveness in all aspects of the training.

Study 5: Community Stakeholder and Patient Experiences

Rendell et al. (2025) also used Thomas’ (2006) approach, this time interviewing community stakeholders (e.g. mental health practitioners, educators, researchers, services users, and leaders of cultural and marginalised groups relevant to the training) and clients (patients) treated by students enrolled in the course. Again, individual and focus group semi-structured interviews were undertaken. A primary finding derived from all participant groups included the importance of relationships. This included students prioritising therapeutic relationships with their clients, and educators maintaining strategic alliances through engaging in outreach with community stakeholders. Client feedback also emphasised the importance of students practicing with confidence, while stakeholder participants prioritised the importance culture and of taking a “perpetual improvement” and values driven approach to the training.

DISCUSSION

For some time, the literature on EMDR training along with discourse among practitioners, have conveyed the need for culturally and contextually relevant courses (DiNardo & Marotta-Walters, 2019; Marich et al., 2020), and recommend the provision of training in university settings (Farrell & Keenan, 2013; Laliotis et al., 2021). This article describes a case study in which a novel, culturally and clinically fit for purpose university postgraduate training program, was successfully developed and delivered using a hybrid online and in person teaching mode at a national scale in New Zealand. Proof of concept was achieved, with fully subscribed offerings and high completion rates within pilot “special topics” courses. This led to the University of Otago approving these courses as permanent offerings within a new postgraduate health sciences qualification. Moreover, a multi study course evaluation programme produced encouraging findings. A co-design project with a stakeholder advisory group ensured the

training and evaluation focused on meaningful areas for relevant community groups. Trainee surveys developed through this work, alongside generic Otago student feedback measures, revealed high levels of endorsement of the courses and teaching. Another study examined our innovative competency evaluation framework by examining student assignment feedback and outcomes. This indicated that the course was able to adequately assess all relevant EMDR practice competencies. A qualitative investigation of student and educator experiences undertaking and delivering the training found that both groups overwhelmingly enjoyed the pilot courses, with the results producing actionable recommendations for improving these in the future. The final study explored the experiences of community stakeholders and clients (patients) treated by students. This provided important insights into what matters most for clients when receiving EMDR, and how vital it is to partner with stakeholders to ensure a feedback loop between the classroom and the community.

The primary implication arising from this case study is that we have provided a teaching model which accounts for both best practice guidelines and geographical and cultural context. We hope that this will be of use to clinical educators looking to develop nationally scaled university training in EMDR within other countries. The development of such training in other areas of the world will have the potential to expand the reach of rigorous training in an evidence-based treatment for highly disabling mental health conditions which are frequently over-represented in marginalised groups.

A limitation of the case study is that we have little information on the post-training impacts of our courses. As noted, there is research indicating that following training, EMDR practitioners may have low rates of practice, lack confidence in delivering the intervention, and may apply EMDR with questionable fidelity to their training model (Collins et al., 2024, Rydberg, 2024). To address these issues, we have initiated further studies focused on our students' post-course uptake of their training, and the clinical outcomes of clients treated by our students (Siu et al., 2025). The initial post-training study (Study 6) will survey our graduates around their post-training practice, with a view to identifying barriers and facilitators to uptake. The second post-training study (Study 7) will use a single case design to record the clinical progress over time, using robust psychometric measures, of clients treated by Otago course graduates. When combined with the initial five studies from our broader evaluation project, these two additional uptake and impact studies will enable us to complete an integrated program evaluation consistent with Kirkpatrick's model (Kirkpatrick & Kirkpatrick, 2006, see Figure 1). This approach incorporates four levels of evaluation including (1) the learner's reaction to the training (their experiences, Studies 2 and 4); (2) the learner's learning (completions and competency evaluations, Studies 1 and 3); (3) the transfer of learning to the workplace (uptake, Study 6); and (4) the results of training (client clinical outcomes, Study 7). Studies 6 and 7 will focus on the classroom to community impacts of our training.



Figure 1. Kirkpatrick's Four Levels of Training Evaluation

Note. From "Evaluation of basic trainings for rescue forces", by L. Niemann & M. T. Thielsch, 2020, *Journal of Homeland Security and Emergency Management*, 17(3), 4 (<https://doi.org/10.1515/jhsem-2019-0062>). Reprinted with permission

CONCLUSION

This article summarises an example of innovative practice in distance and flexible education through the development of a university delivered, fit for purpose training program in EMDR therapy. We provide a model for course development, delivery and evaluation that may be of use for other tertiary education providers or clinical trainers looking to provide comprehensive and rigorous clinical training that meets the learning needs of practicing clinicians at a national scale. Key takeaways from the project include the importance of training practitioners in localised culturally responsive practice; the value in partnering with community stakeholders to ensure broader contextual relevance of the curriculum; the desirability of a hybrid in-person and online clinical teaching mode for practicing mental health professionals; and the value of a 360-degree evaluation approach to inform the ongoing development of training programmes.

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Collaborative Innovation for Inclusive and Sustainable Education Systems: Lessons from Northern Sweden

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ABSTRACT

Northern Sweden is undergoing a profound transformation driven by green industrialization and digitalization. Drawing on primary data from 30 municipalities across a region the size of the UK, this article explores how a locally initiated project, coordinated by two municipal associations, has developed a new model for regional skills planning. Rather than relying on top-down forecasts, the initiative embraces a collaborative innovation approach grounded in mission-oriented and collaborative learning frameworks. These frameworks have been adapted to fit a bottom-up perspective, empowering rural municipalities to co-create data-driven strategies for workforce development. By integrating local knowledge, stakeholder dialogue, and real-time labour market intelligence, the project has enabled more inclusive, adaptive, and place-based education systems. The findings demonstrate how rural regions can take the lead in shaping future-ready skills ecosystems, through shared ownership, digital infrastructure, and a commitment to long-term collaboration. This case offers practical insights for other regions seeking to align education with rapid societal transitions while ensuring that local communities remain active agents of change.

Keywords

Workforce development, collaborative governance, digital platforms, mission-oriented innovation, demographical change, place-based learning, reciprocal learning, inclusive and sustainable education, data-driven platforms, digital and green transition.

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NORTHERN SWEDEN IN TRANSITION

Northern Sweden is undergoing a historic transformation, driven by rapid digitalization and large-scale green industrial investments. The region has emerged as a hub for pioneering initiatives such as fossil-free mining, green steel production, hydrogen energy, and battery manufacturing. These efforts aim not only to reduce environmental impact but also to foster long-term sustainability in an area historically challenged by demographic decline and economic stagnation.

However, realizing this vision requires significant change. Estimates suggest a thirteen-fold increase in renewable energy production and the attraction of up to 100,000 new residents to meet growing labour demands. This reflects global trends, with reports like the World Economic Forum's Future of Jobs 2025 highlighting how green and digital transitions are converging, creating a sharp rise in demand for skills, particularly in STEM and digital fields (Ministry of Foreign Affairs and Trade New Zealand, 2024; World Economic Forum, 2025).

Northern Sweden covers an area of over 223,000 square kilometres, comparable to the size of the United Kingdom, and includes the four northernmost counties. Despite its magnitude, the region is sparsely populated, with approximately 893,000 inhabitants. Figure 1 highlights the municipalities that have participated in the project on which this study is based. The project has been coordinated by two municipal associations: Academy North, comprising 12 municipalities, and the Lapland Local Government Association, comprising 4 municipalities. Both associations work to strengthen skills provision and improve access to lifelong learning through tailored higher education initiative.

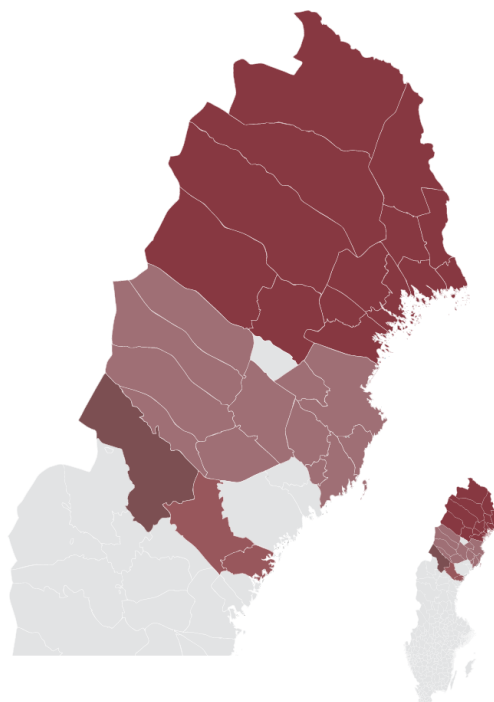


Figure 1: Northern part of Sweden and municipalities involved in the competence mapping

Demographic and Structural Challenges

The region faces several deep-rooted challenges. Demographics are particularly concerning: an aging population and a shrinking working-age demographic are straining welfare systems and eroding the local tax base, which making it harder to maintain essential services. Cultural and linguistic diversity

adds complexity, with four national minority languages, Sami, Meänkieli, Finnish, and Romani, requiring tailored approaches in education and public services.

A critical challenge is the lack of reliable, locally grounded labour market data. The Swedish Public Employment Service once played a key role in local forecasting, but budget cuts and organizational restructuring have weakened this capacity. Today's national forecasts rely on aggregated models, poorly suited to capturing rapid changes in sparsely populated areas. In 2025, only 21% of occupational forecasts in Norrbotten county and 18% in Vasterbotten county were based on local data (Arbetsformedlingen, 2025). Over 80% of forecasts are thus either missing or based on approximations, complicating municipal planning and highlighting systemic imbalances in Sweden's decentralized skills system. In addition to data gaps, many northern municipalities face structural financial constraints. Sweden's tax equalization system often favours densely populated areas, leaving rural regions with limited resources to maintain public services. This creates a negative cycle where underfunded services hinder population growth and further exacerbate demographic decline.

Against this backdrop, the future of northern Sweden depends not only on industrial and technological investments, but also on the capacity to develop locally grounded systems for skills provision. This article presents a regional initiative coordinated by the intermunicipal partnership of two municipality associations. The project aims to establish a structured, data-informed approach for identifying, analysing, and aligning education and training efforts with actual local and regional competence needs. By leveraging primary data and local knowledge, the initiative seeks to build a more targeted, inclusive, and collaborative competence platform, capable of supporting the green transition with people and communities at its core.

THEORETICAL FRAMEWORK

The accelerating industrial transformation in northern Sweden has exposed a critical gap between national-level planning tools and the realities of local labour markets. In sparsely populated regions facing demographic change and rapid technological advancement, traditional forecasting based on historical data often proves inadequate. This disconnect has left local actors, particularly municipalities and small and medium sized enterprises (SMEs), without the strategic insights needed to align education and workforce development with emerging demands.

To address this, the project is grounded in three interlinked theoretical perspectives: mission-oriented innovation, social constructivism, and data-driven analysis. Together, these frameworks offer a multidimensional lens for shaping regional skills ecosystems. Mission-oriented innovation mobilizes public and private actors around shared societal goals. Social constructivism highlights the role of local knowledge, institutional context, and stakeholder interaction. Data-driven analysis provides tools to generate actionable insights from fragmented or incomplete information.

By integrating these perspectives, the project aims not only to interpret the current situation but to help design more adaptive, inclusive, and locally grounded systems for skills planning.

A Mission-Oriented Innovation Approach

In rural and sparsely populated areas, ensuring a well-functioning supply of skills is increasingly complex. Traditional mapping and forecasting rely on national-level data and centralized planning. As shown, northern Sweden lacks regional and local data from national authorities. Where data exists, it

often overlooks the specific needs of SMEs and local governments, which are highly sensitive to regional conditions and rapid change.

Rather than passively receiving national forecasts, stakeholders launched a regional project grounded in mission-oriented innovation. This approach mobilizes actors around a shared, socially relevant goal. Unlike traditional policy, often sector-driven, mission-orientation addresses complex societal challenges through systemic transformation. It emphasizes clear, measurable objectives and fosters cross-sectoral collaboration among public, private, academic, and civil society actors. It combines top-down direction with bottom-up experimentation and prioritizes learning, adaptation, and long-term impact (Mazzucato 2017; Wittmann et al. 2021; Larrue 2021; Hedestig et al. 2024).

This approach reflects a clear ambition to move beyond fragmentation toward a coordinated, data-driven, and collaborative system for identifying and addressing regional skills needs. The project began with a shared recognition of the urgent challenges facing northern Sweden, that is, demographic shifts, industrial transformation, and a fragmented landscape of skills initiatives. In response, the project coordinator mobilized a broad coalition of local and regional actors, that is, municipalities, regional development agencies, educational institutions, employers, and sector organisations, around a common goal. In this context, the mission became clear: to create a robust, data-driven and collaborative system that enables municipalities and employers to identify, understand and act on current and future skills need. The mission was socially relevant, time-bound (2024–2026), and measurable, with indicators such as recruitment needs, training occasions, and validated competencies.

Applying Social Constructivism to Regional Competence Mapping

The project adopted a situated learning approach, positioning regional actors as co-constructors of knowledge through structured interaction, collaborative interpretation, and shared ownership. This reflects both psychological and anthropological strands of situated learning theory, emphasizing that knowledge is context-bound and developed through authentic, collaborative activity (Barab & Duffy, 2000; Vygotsky, 1978). The psychological strand focuses on embedding learning in real-world activities (Brown, Collins & Duguid, 1989), which this project applied by engaging regional actors to interpret labour market data and co-create contextually relevant strategies.

The anthropological perspective, as articulated by Lave and Wenger (1997), deepens this by viewing learning as participation in communities of practice. Learning, thinking, and knowing are relational processes embedded in socially structured activities. This project fostered regional communities of inquiry, where stakeholders actively shaped meaning rather than passively receiving top-down strategies. This aligns with the Māori concept of Ako, reciprocal, context-bound teaching and learning (Berryman, 2018).

The project coordinator's facilitative role reflects the Zone of Proximal Development (ZPD), supporting stakeholders in expanding their strategic capacity through scaffolding, feedback, and shared tools. This mirrors the cognitive apprenticeship model (Collins, Brown & Newman, 1989), where experts guide learners through modelling, coaching, and reflection. Thus, competence mapping became a dynamic, participatory process of regional learning and capacity-building.

The initiative's emphasis on transparency, feedback, and iterative learning reflects the social constructivist focus on reflection, dialogue, and evolving meaning (Schunk, 2012). By designing competence mapping as an ongoing, dialogic process rather than a one-time survey, the model

transformed data collection into a social learning environment. Here, knowledge about future skills needs is negotiated and validated by those embedded in regional labour and education systems.

This theoretical grounding complements the mission-oriented approach by emphasizing collaborative problem-solving, contextual relevance, and long-term capacity-building. Integrating socially situated learning into practice supports both pedagogical development and systemic, goal-driven regional transformation.

Data-Driven Approach for Identification and Analysis

A key challenge in northern Sweden is the lack of detailed data on skills and recruitment needs. Traditional forecasting methods, based on historical data, fail to reflect the region's ongoing industrial transitions. To address this, the project adopted a data-driven approach to analyse large volumes of labour market data and provide an up-to-date picture of in-demand skills, even at the local level.

This approach is scalable, timely, and less prone to subjective bias than expert-based assessments (Brasse et al., 2024). Methods such as job advertisement analysis and unsupervised machine learning (e.g., hierarchical clustering) help identify both established and emerging skills by detecting co-occurrence patterns and forming meaningful clusters, often beyond existing taxonomies.

Recent research also highlights the potential of large language models (LLMs) to align different competency frameworks (Jemal et al., 2025). In regions like northern Sweden, where terminology varies, LLMs help identify overlaps and equivalencies, enabling a more harmonised understanding of skills needs.

While job ads reflect current demand, they may miss emerging or long-term competencies. To address this, the project used a triangulated approach—combining quantitative data from HR units with qualitative insights from expert assessments, industry associations, and regional stakeholders. This integration enhances the validity and usability of results, supporting more targeted and adaptive skills planning.

RESEARCH METHOD

A case study approach was selected as the most appropriate method for this project due to its ability to capture complex, real-world phenomena in context. The project Sustainable Skills Supply in Northern Sweden addresses multifaceted challenges related to workforce development in a region undergoing rapid industrial transformation, demographic shifts, and large-scale investments. These dynamics require a methodology capable of exploring both structural processes and stakeholder interactions in depth.

Case studies are particularly suited for answering “how” and “why” questions, especially when researchers have limited control over events and the focus is on contemporary, real-life contexts (Yin, 2016; 2018). This study aimed to understand how municipalities, regional authorities, educational institutions, and industry actors collaborate to identify and address skills gaps. The design enabled a detailed, contextualized examination of these collaborative processes and governance structures.

The project was grounded in an exploratory perspective on how data-driven and collaborative approaches can build inclusive, adaptive education systems that respond to real-time skills needs. This reflects the ambition to make education systems more responsive, equitable, and future-oriented through real-time data and multi-level collaboration.

The project generated a rich empirical dataset, including digital surveys, stakeholder workshops, expert interviews, and secondary labour market data. Case study methodology supports the integration of multiple sources, enhancing validity through triangulation (Denzin, 2012). This is especially important in rapidly changing contexts, where timely, diverse information is critical for strategic planning. The involvement of multiple governance levels and stakeholder groups enabled a multifaceted analysis of decision-making and implementation. While not statistically generalizable, the findings are analytically transferable to other regions facing similar challenges. As Flyvbjerg (2006) notes, case studies offer valuable insights into broader processes by providing rich, context-specific knowledge that informs both theory and practice.

Data Collection and Research Procedures

Data were collected between February and March 2024 through two structured digital surveys:

- One targeting public sector employers (334 responses from HR managers and department heads across 27 municipalities). In October 2024, all municipalities were offered the opportunity to review and revise their submitted data; 10 municipalities chose to revise their initial responses.
- One targeting private sector SMEs (548 responses from companies across 30 municipalities).

The surveys were designed using the esMaker platform and distributed via municipal HR departments and business development offices. Survey instruments were validated by Statistics Sweden (SCB) to ensure clarity, relevance, and alignment with national occupational classification standards.

Additional qualitative data were collected through:

- Workshops with municipal officials and regional development units.
- Expert consultations with industry representatives, including construction companies, the Swedish Industrial Council, and the Swedish hospitality industry association.
- Secondary data from national labour market forecasts and regional planning documents.
- Interviews and study visits to benchmark best practices in regional skills planning, including mapping initiatives by municipalities (e.g., Boden, Lulea, Bengtsfors) and regional authorities (e.g., Region Gavleborg).

Data Analysis and Validity and Reliability Measures

Quantitative data was analysed using Excel and a secure, enterprise-level GPT-based analytics platform. The analysis focused on identifying patterns in recruitment needs, skills gaps, and training demands across sectors and regions. Qualitative data (open-ended responses and workshop notes) were analysed thematically to identify recurring challenges, strategic priorities, and opportunities for collaboration.

To ensure the validity of the findings, the survey instruments were reviewed and validated by Statistics Sweden to ensure measurement accuracy. The questions were aligned with national classification systems, SSYK for the private sector (Standard for Swedish Occupational Classification, SCB 2023) and AID for the public sector (Work Identification, SKR 2025), to maintain consistency and comparability across respondent groups. Data triangulation was applied by integrating multiple sources, including survey responses, stakeholder workshop insights, and external labour market forecasts, thereby enhancing the analytical depth and contextual relevance of the results (Denzin, 2012).

Reliability was addressed through the implementation of a standardized data collection protocol across all participating municipalities. Surveys were distributed via official municipal channels, ensuring the authenticity of responses. All data were anonymized and processed in a secure environment, with explicit safeguards to prevent its use in AI model training or other unintended applications (Bergvall et al. 2024). Although the sample is not statistically representative, the broad participation across sectors and regions enhances the credibility and transferability of the findings. The diversity of respondents provides a robust foundation for drawing meaningful conclusions about regional skills needs and collaborative strategies for sustainable workforce development (Yin, 2016).

FROM FRAGMENTATION TO COORDINATION: BUILDING LOCAL CAPACITY

Northern Sweden is undergoing rapid green and industrial change, but small and rural municipalities often lack the tools and support to meet evolving skills demands. To understand this challenge, it is essential to explain how Sweden's skills system is governed. The country operates under a highly decentralized model which means that municipalities are responsible for upper secondary education, adult education and local economic development. However, they have no formal authority over vocational or higher education, which remains a national responsibility. Despite this, municipalities are increasingly expected to coordinate across sectors, engage with employers, and lead regional skills strategies, even in the absence of clear mandates, resources, or access to reliable data. This results in a governance gap, particularly visible in rural and sparsely populated regions.

The Confederation of Swedish Enterprise has explicitly stated that “businesses need municipalities that step forward and act” (Svenskt Näringsliv, 2023). However, this growing responsibility is not matched by a national strategy for capacity-building or support. The OECD has also noted that Sweden's skills system lacks coordinated structures, consistent information-sharing, and a shared vision among actors. This has resulted in fragmented planning, weak alignment between training provision and labour market needs, and a lack of strategic foresight in many parts of the country (OECD 2024).

At the same time SMEs face their own set of structural challenges. Although they play a central role in national skills provision, they often lack the capacity to systematically identify, map, and deliver competence development initiatives. Findings from national reports by Tillvaxtanalys (2021; 2022) highlight that SMEs generally operate under significant resource constraints, which limit their ability to engage in strategic human capital planning. Skills needs are typically identified reactively, that is, only when they begin to affect daily operations or when external demands shift rapidly, such as during technological transitions or crises like the COVID-19 pandemic.

Strategic forecasting of future skill demands is rare, largely due to the absence of dedicated HR functions and a general lack of awareness around long-term workforce planning. In many SMEs, the responsibility for managing skills supply falls on business owners or managers who are already burdened with operational tasks. Similarly, the mapping of existing competencies is seldom done systematically. SMEs rarely use formal tools such as skills audits or national qualification frameworks (e.g., SeQF) to evaluate the knowledge and capabilities of their employees. Competence is often viewed as implicit and embedded in daily tasks, rather than as something that can be formally documented and strategically developed. This limited mapping capacity makes it more difficult to plan targeted learning or upskilling efforts.

When it comes to the delivery of competence development, SMEs tend to favour informal, on-the-job learning over structured training. External courses and training programs are often perceived as expensive, time-consuming, and offering uncertain returns in terms of productivity or profitability. Many firms focus instead on task-based learning or short, problem-driven skill acquisition. While the pandemic accelerated digitalization in many SMEs, opening new possibilities for remote learning and recruitment, the long-term impact of these changes on competence development remains unclear, particularly in relation to informal knowledge sharing and experiential learning.

In this context, rural municipalities face a dual challenge. They are expected to act as strategic conveners of education and labour market policy, while lacking the institutional tools and data infrastructure to do so. Traditional top-down models of skills planning are ill-suited to these conditions. What is needed instead are place-based and locally mission-driven approaches that empower local actors to take the lead in identifying, understanding, and addressing their own skills challenges.

In response, Academy North initiated several activities and projects, with the objective to empower local actors and enable strategic collaboration across sectors. At its core lies the principle of local data ownership, which means that municipalities must have access to, understanding of, and control over their own data to play a meaningful role in shaping education and workforce development. In this model, data is not merely a technical input, it is a prerequisite for strategic capacity. By establishing a shared infrastructure for skills mapping, programme coordination, and cross-sectoral collaboration, the project provides a platform through which municipalities, businesses, and education providers can jointly analyse needs, identify shared solutions, and act proactively. The work is anchored in a regional planning cycle and aligned with international recommendations from the OECD and the EU's Action Plan on Labour and Skills Shortages. In doing so, the project participants want to demonstrate how rural and peripheral regions can take the lead in building the skills systems of the future—through locally governed, collaboratively used, and mission-driven data.

Learning Together, Acting Together: From Mission Formation to Systematic Action

The development of a collaborative model for skills governance in northern Sweden unfolded gradually between 2020 and 2023. Anchored in a mission-oriented innovation framework, this process brought together 17 rural municipalities, universities, business representatives, and civil society organizations to address the growing mismatch between education systems and labour market needs in sparsely populated areas. It was not a top-down initiative, but rather a locally rooted transformation built on partnerships, shared visioning, and iterative learning. The culmination of this work was a region-wide skills mapping effort conducted in 2024, the first of its kind in scope, method, and precision (Bergvall et al 2024).

The foundation was laid in June 2020, when a digital strategy session was held with elected leaders from 17 municipalities, senior civil servants, university representatives, and the Swedish Minister for Higher Education. The discussion focused on one guiding question: “Where do we want to be in two years?”. This led to the formulation of a joint mission: to ensure equitable access to higher education and relevant training in rural areas through local learning centres, supported by a coordinated and data-informed system. The group agreed that building such a system required a structured approach that would link education providers with local realities and future workforce needs.

This mission was operationalized through several steps. Firstly, stakeholders were identified, including municipalities, universities, public sector employers, SMEs, regional development actors, and industry

associations. Shared goals were set, informed by previous assessments of local educational gaps and inspired by promising practices and experiences from national and cross-border collaborations. From this foundation, a joint roadmap was developed. Key themes included strengthening local infrastructure, enhancing digital platforms, designing new models for work-based learning, and building long-term institutional capacity. A central mechanism in this process was reciprocal learning. A series of regional workshops, including a two-day event in late 2021, created space for municipalities, educators, and researchers to exchange knowledge and experiences. Through SWOT analyses, peer dialogue, and feedback loops, the group co-created routines for data collection, decision-making, and collaboration. Participants emphasized the importance of acting locally, not waiting for national reforms but focusing on what could be done collectively in the region.

By 2022, the value of locally collected primary data had become increasingly clear. Traditional labour market forecasts, based on national averages, failed to reflect real needs in rural municipalities. Over the course of 2021–2023, the partnership came to realize that granular, microscale data, gathered directly from municipal HR departments and small businesses was not just useful for planning, but strategically powerful. In the context of an information-driven economy, data became a form of influence. Those who could produce and interpret data on recruitment and skills needs held a key role in shaping both educational design and labour market strategies. Different actors could here derive different value from the same dataset. This interpretive flexibility could make data a common platform for shared analysis and decision-making while also promoting mutual learning across sectors. The data is here never static, it is part of a dynamic dialogue between policy, education, and labour market actors.

To structure this endeavour, the partnership created a digital infrastructure and a shared annual planning cycle. Digital platforms played a vital role - not just in collecting data, but in clustering needs, visualizing patterns, and facilitating collaboration across municipalities. This included harmonized surveys tailored to both public and private sector employers, structured data validation processes, and AI-supported analytics. Local ownership of the data was essential, the municipalities retained full control over their own datasets, ensuring that insights could be directly applied to local planning and decision-making. Unlike many traditional mapping efforts where data is collected but remains siloed with external consultants or project leads, this model was deliberately designed to prevent knowledge loss and maximize utility. By embedding the data within local governance processes, the project avoided the common pitfall of extractive analysis and instead transformed data collection into a strategic resource for both local and regional capacity-building.

By 2023, the groundwork was in place for the most comprehensive skills mapping ever conducted in the region. This approach was grounded in substantial preparatory work. Initially, the partnership developed a pilot survey focused narrowly on vocational training needs within SMEs and public sector employers. However, critical feedback revealed that the tool was too limited in scope and missed broader recruitment and upskilling needs. This insight triggered a broader design rethink: rather than build surveys around predefined educational formats, the team aimed to construct a flexible instrument that could map general workforce and training needs while enabling the data to be structured and interpreted from multiple perspectives. The objective was to avoid “wasting data” by ensuring that responses could be used both at aggregate levels and as hands-on planning tools for practitioners in municipalities, regional bodies, or national agencies.

To achieve this, the team drew on comparative examples from other Swedish municipalities and prior projects. They organized a collaborative design workshop that brought together skills strategists from two northern regional governments, municipal representatives responsible for workforce planning, and local business organizations. The resulting model included two standardized but adaptable surveys. To ensure sustainability and analytical consistency, Academy North led the development of two harmonized survey instruments tailored to the needs of each sector. One was designed for public sector employers, using Sweden's standardized job classification system, developed by the Swedish Association of Local Authorities and Regions. The other was developed for SMEs, based on the occupational taxonomy used by the Swedish Public Employment Service and enhanced through dialogue with national industry associations to better reflect real job titles and recruitment profiles. During Q1 2024, the survey was launched across 31 municipalities, generating over 800 employer responses and yielding detailed insights into more than 50,000 recruitment needs and 39,000 training needs.

The data was then structured into two separate but interoperable databases, one for the public sector and one for SMEs. Each database made it possible to view recruitment needs per municipality and occupation. Additionally, they captured detailed information on training needs, that is, how many individuals required upskilling, what types of programs were in demand, and how respondents preferred these to be delivered. The data focused on the period 2024–2026, a seemingly narrow window, yet deliberately chosen to encourage a sense of urgency and promote timely decision-making. Earlier work had shown that skills data quickly loses its relevance unless acted upon within a short timeframe.

Crucially, the project operated on the principle that primary data offers the strongest analytical foundation when combined with additional layers of contextual input. Rather than viewing the survey data as self-contained, the team recognized that its value could be enhanced through triangulation with other perspectives. To this end, national industry associations were invited to contribute their sector-specific insights. Organizations such as the Swedish Construction Federation, the Installers' Federation, the Swedish Hospitality Industry and the Swedish Industrial Council provided input on key occupational roles and sectoral trends relevant to the region.

This collaborative layering of primary and secondary data enabled a more complete and actionable analysis, one that captured both grassroots realities and broader structural shifts. It ensured that the regional picture was not only empirically grounded but also responsive to national developments and labour market dynamics.

Based on this multi-source analysis, a comprehensive regional report summarizing recruitment and training needs across northern Sweden was produced. In the months that followed, participating public-sector stakeholders were offered the opportunity to review and revise their data inputs. These revisions were integrated into version 2 of the regional workforce report, enhancing both its precision and strategic utility. All data from the public and private sectors was anonymized and shared with relevant national and EU-level authorities, contributing to a wider evidence base for coordinated skills policy and education planning.

OUTCOMES AND IMPACT

The outcomes of the coordinated regional effort in northern Sweden have been both structural and operational, leading to measurable progress in accessibility, alignment, and system resilience. One of

the most important changes was the ability to link educational initiatives directly to local conditions. By conducting a large-scale, municipally anchored mapping of recruitment and upskilling needs, northern Sweden supported the development of training offers that allowed people to study where they live. This included expanding national university entrance exams to rural testing sites, removing a longstanding geographic barrier to participation.

The strategic utility of the project's primary data became particularly evident in healthcare workforce planning. For instance, the survey revealed that Norrbotten County needs 265 newly qualified registered nurses between 2024 and 2026, accounting for both expansion and replacement demands. When compared with regional matching indicators, estimating annual inflows and outflows of qualified professionals, retirements, and transitions to specialist roles, the analysis shows the region currently produces a net surplus of only 14 nurses per year. At this rate, it would take nearly 19 years to meet the projected two-year need, assuming no additional demand arises.

However, this gap is likely even greater in practice. Matching indicators do not account for whether individuals with relevant qualifications are working in the right occupation or sector. Nor do they reflect whether the workforce has the specific language skills required in the region, necessary to meet legal and cultural obligations in several municipalities. Furthermore, the demography of northern Sweden poses additional structural challenges: a small working-age population must support a rapidly ageing population, often across large geographic distances.

By integrating these layers of analysis, the data has shifted conversations with universities and national agencies from general assertions of shortage to nuanced, evidence-based discussions about capacity, distribution, and delivery. Rather than arguing for additional training places based on perceived need, municipalities can now demonstrate specific mismatches grounded in real-time labour market intelligence. This supports more targeted decision-making at institutional, and policy levels and fosters shared responsibility across education and healthcare ecosystems.

In parallel, the initiative enhanced the resilience of the regional education system. By standardizing the mapping method and integrating it into existing municipal planning structures, the project moved skills governance from ad hoc projects to recurring, coordinated processes. It also promoted horizontal learning across municipalities, where tools, methods, and insights could be shared, forming a regional infrastructure for continuous analysis and action. Collaboration with universities improved the planning and coordination of school and clinical placements, particularly in municipalities where such structures were previously lacking. These placements are now seen not only as pedagogical components but also as key tools for workforce recruitment.

Several training initiatives were supported or catalysed through the project, particularly in response to insights from the regional skills mapping. For example, pilot programs in preschool education, health and social care, and tourism were developed in collaboration with universities and local actors. By providing timely, detailed, and locally grounded data, the project helped universities and training providers make more informed decisions about where and how to initiate new educational offerings. These efforts reflect a broader shift, where rural municipalities are not just recipients of education policy but active partners in shaping the regional skills agenda. This momentum has inspired several municipalities to explore designation as regional learning campuses, signalling a long-term commitment to accessible and place-based education infrastructure.

The project also signalled a shift from broad-based outreach to data-informed strategic communication in education. By identifying specific recruitment and training needs at municipal and occupational levels, the project enabled local actors to tailor their messaging more precisely. Rather than promoting education in broad terms, communications could now focus on the types of programs and professions most urgently needed in the region. This approach positioned marketing not only as a tool for awareness but as a functional part of long-term skills planning.

A regional campaign titled Education for the Future was launched in autumn 2023, reaching over 64,000 individuals through local media, social channels, and targeted outreach. The campaign used real-life stories of adult learners to build trust and inspire participation, particularly among groups less likely to engage with formal education. What set this effort apart was its grounding in real data—messages could highlight not only the value of learning but its relevance to local employment opportunities and community needs. In parallel, the project invested in building and maintaining a digital platform to sustain and expand outreach over time. This long-term effort has proven highly effective: in 2025, the platform surpassed 150,000 cumulative visits in April, reflecting its growing role as a trusted resource for residents exploring education and career options. The alignment between labour market analysis and public-facing communication represents a key innovation—bringing together data, narrative, and digital infrastructure in service of inclusive and strategic regional development.

Finally, the groundwork laid by the project led to the launch of a new initiative in 2025, in collaboration with the national Transition Fund, Umea University, and 16 municipalities. This follow-up project focuses on converting strategic insights from the mapping process into operational tools for municipal workforce planning. It supports data-informed educational design, cross-sectoral coordination, and a digital platform for long-term knowledge sharing. In this way, the impact of the original project continues to grow, providing both structure and momentum for a more equitable and adaptive regional skills ecosystem.

THEORETICAL FOUNDATIONS AND PRACTICAL APPLICATIONS

One of the most significant outcomes of the project has been the development of a practical, transferable model for regional skills planning that integrates three complementary theoretical frameworks. These frameworks are not merely conceptual references; they have been operationalized in ways that directly shaped the project's methodology, stakeholder engagement, and long-term impact.

Mission-oriented innovation provided the strategic foundation by anchoring the work in a clearly defined societal challenge: the need to secure sustainable skills provision amid industrial transformation and demographic change in northern Sweden. What makes this noteworthy is that mission-oriented approaches are typically designed and implemented at national or supranational levels. In contrast, this project successfully adapted and applied the model locally and regionally, which is often more complex due to fragmented governance, limited resources, and the need for cross-sectoral coordination. By localizing the mission, the project showed how place-based innovation can address systemic challenges in ways that are both strategic and grounded in local realities.

This localization process, however, has not been without challenges. Regional and local actors often lack the time, resources, or analytical capacity to fully engage in strategic planning. Many municipalities, particularly smaller ones, operate with thin administrative structures, making long-

term skills planning a low priority amid more immediate demands. Compounding this is a systemic tension between regional responsibilities and local utility. While regions are formally tasked with leading strategic workforce planning, their analytical efforts often prioritize reporting to national agencies or internal strategy development, without necessarily considering how outputs can support or empower local decision-making. As a result, data and tools produced at the regional level may be technically robust but lack relevance or accessibility for municipal actors. Against this backdrop, the orchestration role played by the project team was critical: serving as facilitator, interpreter, and bridge-builder between municipalities, education providers, and regional and national agencies. By designing a methodology that was both rigorous and locally actionable, the project showed how data can be structured to serve multiple governance levels simultaneously, supporting both top-down coordination and bottom-up engagement.

Social constructivist learning informed the project's approach to knowledge development and capacity building. Rather than treating skills needs as fixed or universal, the project emphasized context-specific understanding, co-creation, and iterative learning. Through workshops, local validation, and stakeholder dialogues, knowledge was constructed collaboratively, ensuring that resulting insights were both relevant and actionable for those directly affected. Importantly, this co-creative process revealed significant variation in how municipalities approach skills planning—some had established routines and institutional memory, while others were entering the field for the first time. Peer-to-peer learning within the network was not just a benefit, but a necessity. It also surfaced tensions around ownership, pace, and prioritization, underscoring the need for tailored support strategies depending on municipal size and maturity.

The data-driven approach served as the empirical backbone of the project. By collecting and analysing primary data from over 800 employers and combining it with secondary sources and AI-supported tools, the project generated a detailed, dynamic picture of recruitment and training needs across sectors and geographies. This enabled evidence-based decision-making at both strategic and operational levels and laid the groundwork for continuous monitoring and adaptation.

Together, these three frameworks form a mutually reinforcing system: the mission defines the “why,” the constructivist approach shapes the “how,” and the data provides the “what” and “where.” This integrated model has several practical implications. First, it shows that future initiatives should begin with a clearly articulated societal mission and involve stakeholders early through co-design and shared ownership. In practice, however, ensuring shared ownership required deliberate trust-building and the creation of low-threshold entry points for participation. Group-based activities, such as regional workshops and validation sessions, served not only to gather input but to cultivate commitment and mutual understanding across administrative boundaries.

Second, the model shows that data collection must be inclusive and sensitive to local conditions, using validated tools and harmonized classification systems to ensure comparability and usability. Third, it highlights the importance of combining quantitative and qualitative analysis, and of returning findings to local actors in formats that support practical application. Finally, it underscores the need for transparency, feedback, and continuous learning, as well as the development of a shared digital infrastructure and governance platform to sustain long-term collaboration.

By applying this model, regions can move from reactive, fragmented planning to proactive and anticipatory skills ecosystems. The project thus offers not only a set of findings, but a replicable framework for systemic change—grounded in theory, tested in practice, and ready for scaling.

CONCLUSION

This project has clearly demonstrated the importance of locally grounded and data-driven approaches to skills provision in regions undergoing rapid transformation. In northern Sweden, where demographic shifts, industrial expansion, and increasing demands on the public sector converge, traditional forecasting tools have proven inadequate. By collecting primary data from over 800 employers across 30 municipalities, the project has filled a long-standing gap in the national skills system. The identification of over 50,000 recruitment needs and nearly 39,000 training needs, particularly in digitalization, sustainability, and healthcare, provides a solid foundation for targeted educational interventions and strategic workforce planning.

The project has also contributed to strengthening governance and collaboration. Through transregional cooperation, municipalities and SMEs have been able to scale up training efforts that would otherwise not have been feasible. The clear demand for short, flexible learning formats reflects a broader shift in how skills development must adapt to the realities of working life. At the same time, the project has increased the capacity of local actors to own and use their own data for strategic planning, helping to reduce the governance asymmetries that have long characterized skills policy in rural areas.

The project has also made a significant contribution to the field of online and distance learning. The strong preference among employers for short, web-based, and modular training formats underscores the need for flexible and accessible educational models. The findings support the development of micro- and nanolearning, practical digital workshops, and hybrid formats that meet the needs of both the public and private sectors. By leveraging municipal learning centres and digital platforms, the project has helped expand access to education in rural areas, thereby strengthening the role of distance learning in regional development. The social constructivist approach, with its emphasis on contextualized learning, co-creation, and local validation, has further deepened the pedagogical foundation for these formats. The project also shows how data-driven insights can be used to design and deliver training that is relevant, targeted, and responsive to real-world needs.

To enable replication and scaling, the project offers a practical model that combines mission-oriented innovation, social constructivist learning, and data-driven analysis. As a result, future initiatives should begin with a clearly articulated societal mission and involve stakeholders early through co-design and shared ownership. Data collection must be inclusive and sensitive to local conditions, using validated tools and harmonized classification systems to ensure comparability and usability. Analytical methods should combine quantitative and qualitative insights, and findings must be returned to local actors in formats that support practical application. Transparency, feedback, and continuous learning are essential to maintain trust and adaptability. Finally, the development of a shared digital infrastructure and governance platform will be crucial for sustaining long-term collaboration, enabling regions to move from reactive planning to proactive, anticipatory skills ecosystems.

Looking ahead, the continued development of a robust data-driven approach will be crucial to strengthening the regional skills ecosystem. One particularly direction is the integration of artificial intelligence (AI) and predictive analytics to enhance both foresight capacity and adaptability within education and labour market systems. The project has already laid the groundwork by combining primary data with structured classification systems and AI-supported analysis. The next step should be to develop dynamic forecasting models that integrate real-time labour market data, demographic

trends, and industrial investment pipelines to anticipate future skills needs. Natural language processing (NLP) can be used to analyse qualitative responses from employers, identifying hidden trends and contextual nuances that might otherwise be overlooked. Interactive decision-support tools and simulation platforms can enable municipalities, education providers, and employers to test different scenarios and make more informed decisions. Automated feedback loops between data collection, analysis, and policy design will ensure that insights are continuously updated and remain relevant. To make this a reality, local actors must also be supported in interpreting and applying AI-generated insights, which requires increased AI literacy at the local level.

By embedding AI and advanced analytics at the core of regional skills planning, northern Sweden can become a model for how rural and industrial regions can lead the transition toward smart, inclusive, and future-oriented education systems. This development will not only improve the match between education and employment but also strengthen the region's resilience in the face of technological, demographic, and economic change.

AUTHORS' NOTES

For the translation and localization of content, ChatGPT tool 4.0 version June/July was employed. Human translators subsequently reviewed and adjusted the translations to ensure accuracy, cultural appropriateness, and contextual relevance. The final text was thoroughly reviewed and approved by the authors to ensure it accurately reflects the intended research outcomes and ethical standards. The authors also assessed and addressed potential biases inherent in the AI-generated content. The final version of the paper is the sole responsibility of the human authors (Bozkurt, 2024).

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Reappraising Discussion Forums in Graduate Education for the GenAI Era

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ABSTRACT

With the ubiquity of GenAI reappraising the role of discussion forums is currently part of graduate program quality improvement efforts. The negative aspects of discussion forums are well known: too much burdensome work; no or limited teacher/teaching presence; a replacement of the instructor; and now AI talking to AI. Not only is this type of posting not an authentic response, but the volume of posts may inflate and dilute the educational experience. As part of understanding the evolution of discussion forums, a Critical Friends approach was applied to reappraise the role and quality of forums for both instructors and students. Using recent graduate student surveys and feedback in an online doctoral program results indicated merit in discussion forums but not as the only means of exchanging ideas, creating a learning community, or developing critical thinking. As professors we support authentic interactions with and among our graduate students including their educational resources and activities, and as part of meeting program outcomes and nurturing deep learning. This paper presents the results of our Critical Friends discussions and literature review alongside our re-thinking asynchronous discussion forums. Strategies to nurture novel and quality discussions that foster deep learning are proposed.

Keywords

discussion forums, asynchronous forums, online education, GenAI, Critical Friends

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INTRODUCTION

The negative aspects of discussion forums are well known: too much burdensome work; no or limited teacher/teaching presence, and a replacement of the instructor. More recently, in a quality improvement initiative of an online doctoral program, we heard students' concerns about AI talking to AI in graduate course discussion forums. Just as the textbook has dominated the creation of a course, online forums have dominated the design and pedagogy of online courses for decades (Akpen et al., 2024; Lauzon & Moore, 1991), especially in asynchronous courses. Due to packed schedules, long to-do lists, and overwhelm, convenience may win out for graduate students who turn to generative artificial intelligence (GenAI) to create posts and respond in online forums. Not only is this type of posting not an authentic response, but the volume of posts may inflate and dilute the educational experience (Vaughan et al., 2013).

The use of online discussion forums has roots in the bulletin board systems of the 1970s and 1980s (Harasim, 2006). Over the decades as the worldwide web developed and online learning grew; educational technologies saw the potential of posting and commenting as part of instructional design choices. Learning management systems, such as Blackboard and Moodle, furthered the use of online forums as a foundation to asynchronous learning environments. The hierarchical structure of discussion forums organizes the posts with the main forum category having sub-forums (topics) and threads (comments on the topics). Although hyperlinks and multimedia are now possible to embed within a post, the overall design harkens to the bulletin board systems and continues to be linear, hierarchical, and nested.

As part of reappraising discussion forums (DF) in the age of GenAI and as part of program quality improvement, it is worthwhile noting that the word forum comes from the Latin forum(s). Fora(pl) were marketplaces for purchasing goods and also served as social sites for the exchange of ideas. They were frequently designed in a semi-circle that comfortably accommodated both small and large gatherings (Britannica, n.d.). For the Romans, fora held both pragmatic and idealistic functions; as part of writing this paper and through our Critical Friend discussions (Storey & Brandon, 2015), we three authors also toggled between being practical and visionary thinking in our reappraisal of discussion forums.

The role of discussions forums has been the topic of hundreds of papers (Akpen et al., 2024; Fehrman & Watson, 2021; Thomas 2013). In summary, forums provide an organized approach to the topics being studied; develop student communication and critical thinking skills; allow for resource sharing and archiving of discussions; provide learning accessibility and time convenience; support individual learning (e.g., peer to peer, diverse perspectives, reflective opportunities); and, create a community of learners that can strengthen professional networks and provide a sense of belonging. (Akpen et al., 2024). Challenges and negative aspects of traditional discussion forums include: technical and navigational issues that discourage learners; privacy and security issues such as data exposure or negative interactions such as cyberbullying (Akpen et al., 2024); burdensome workload and time commitment leading to low participation or passive consumption and limited student engagement (Yukselturk, 2010), especially when repetitive content appears; miscommunications or misinterpretations which are especially difficult with sensitive topics; varied quality including incorrect or misleading information (Lander, 2015); either limited teacher presence or over-moderation that squashes genuine discussions (Lander, 2015); and posting for grades or the appearance of engaged participation rather than for authenticity and learning (Osbourne, 2018).

Recent graduate student feedback in an online doctoral program sees merit in discussion forums but not as the only means of exchanging ideas, creating a learning community, or developing critical thinking (Al-Husban, 2020). As professors, we support authentic interactions with and among our graduate students including their educational resources and activities. These processes are part of meeting program learning outcomes and nurturing a deep learning, growth mindset (Dweck, 2016).

But with the ubiquity of GenAI what is needed for reappraising discussion forums? We suggest a mindful pause that creates the opportunity for awareness to emerge and to consider options. This paper presents the results of our Critical Friends (CF) exploration into re-designing asynchronous discussion forums in the age of GenAI. In our reappraisal, we provide strategies and design suggestions alongside a pedagogical mindset.

CRITICAL FRIENDS AND CONVERSATIONS

In co-creating this paper, the authors applied aspects of the Critical Friends framework (Storey & Brendan, 2015) through regular online meetings. We would listen carefully, ask questions, gently challenge assumptions, and share readings and data for deeper reflection. These on-going conversations toggled between the “continuum of practice-driven and self-exploratory orientations” (Yuan et al., 2024, p. 904) concerning the changes wrought by GenAI to online education. These conversations inspired wayfinding and sense-making for both pragmatic and idealistic reasons

The CF framework can be very formal as it moves through the six steps (i.e., presentation, probing session, positive feedback, cool feedback, problem discussion and challenge) (Storey & Brendan, 2015). In contrast, our conversations were more organic, circular, and less prescribed yet held the essential elements of CF. For a wicked problem such as GenAI with its implications for graduate-level discussion forums, conversational wayfinding and sense-making supported our own self-reflection processes as well as co-creating knowledge together. It highlighted our uncertainty and vulnerability – two seldom declared emotions for academics to acknowledge. These emotions stand alongside our desires to understand more deeply and work toward reasserting a sense of control and knowing how to proceed for the benefit of our students. Through the survey results, their voices found their way into our CF discussions and helped us think through this fast-changing education landscape.

THE CHALLENGES OF DISCUSSION FORUMS

Most of the issues identified in ODDE literature on discussion forums speak to challenges that stem from the asynchronous, text-based nature of forums: the lack of nonverbal cues, delayed feedback, and often formulaic participation requirements. A persistent challenge in online discussion forums is maintaining high levels of student engagement and meaningful participation, with both the quantity and quality of student contributions often being inconsistent or superficial. Cognitive engagement—reflecting deeper learning and critical thinking—is particularly difficult to foster and assess (Gorgun et al., 2022; Kew & Tasir, 2021). Often posts sound descriptive and even repetitive. They exhibit surface-level thinking and low-level knowledge construction (Hew & Cheung, 2012), lacking critical analysis and synthesis which is the aim of this knowledge co-creation process (Kew & Tasir, 2021). Research emphasizes that the depth of discussion, not just the frequency of posts, is crucial for learning through knowledge exchange.

For discussion moderators/designers, the challenge lies in designing prompts and moderation strategies that elicit analytical, thoughtful, and reflective, responses from students (Hamadi et al.,

2023). Assessing student contributions for both the depth and breadth of engagement is not straightforward, resulting in common overemphasis on post quantity rather than quality (Hew & Cheung, 2012); lack of clear rubrics and difficulties in providing timely formative feedback is yet another issue distilled in ODDE literature (de Lima et al., 2019). Equally essential is effective moderation which is resource-intensive and requires specific skills so that moderators can balance guiding discussions with allowing organic interaction, manage off-topic or disruptive posts, and foster a respectful, inclusive environment. Setting clear guidelines and expectations is critical, yet consistently encouraging/promoting such guidelines can be challenging, especially in large or diverse classes (Kourkouli, 2024).

Socio-emotional issues

Bunsu et al. (2025), in their systematic review of discussion forums in online learning, agree that superficial participation with many students posting only to fulfill requirements, is a common issue in the forums. The linear structure and dynamics of these discussions, combined with the absence of nonverbal cues and real-time interaction lacking immediacy and socio-emotional richness, may lead to feelings of isolation and loneliness. Besides, some students dominate discussions while others remain passive, resulting in unequal contributions impacting collective dynamics and individual emotions.

Bunsu and colleagues conclude that fostering social presence and encouraging deep social discourse can enhance meaningful engagement in such forums. When forum tasks invite personal sharing and reflective dialogue, students reported a greater sense of connection and reduced isolation, especially in contexts where students felt otherwise disconnected. The authors also emphasized that the timing and reciprocity of interactions are key to sustaining engagement. Along with careful facilitation to avoid superficial agreement or negative interactions, these more authentic and emotionally rich discussions can humanize the online environment, making it more emotionally engaging and supportive. In this way, Such forum discussions promote equitable participation and “‘messiness’ of interactions... as demonstrated in the uncontrollable, unpredictable, and deeply personal engagements” (Essa et al., 2023; p. 512).

Relatedly, students in online discussion forums face challenges in managing their emotions, especially when confronted with a lack of response, criticism, disagreement, or “linguistic choices and tone that can establish power relations or reinforce existing unequal relations” (Essa et al., 2023; p. 519). The public and permanent nature of forum posts can heighten anxiety about making mistakes or being judged, leading to over-editing or hesitancy to share ideas.

Additionally, the requirement to keep up with multiple threads and respond thoughtfully to peers can lead to cognitive and emotional fatigue. The volume of posts in large classes can be particularly overwhelming, making it difficult for students to engage meaningfully with all discussions (Neha & Kim, 2023).

Addressing these issues requires intentional design and facilitation strategies that enhance social presence and foster authentic community building based on trustworthy connections.

Technical - platform usability, access issues, privacy and security concerns

Another critical dimension to consider is the technological limitations inherent in the learning management systems (LMS) that host online discussion forums. Foremost among these are platform

usability issues, which can significantly hinder the learning process and the effectiveness of digital discussion forums. Common challenges include complex navigation, unintuitive interfaces, and inadequate editing tools—factors that can easily overwhelm students and diminish their engagement (Almusharraf, 2024; or a discussion forum specific one). These usability problems are further exacerbated by the technical design of many platforms, which often prioritize the quantity of posts over the quality of contributions. This emphasis can result in superficial participation rather than fostering meaningful academic discourse that is essential for deep learning (Hamadi et al., 2023).

Access issues, including the digital divide and digital literacy disparities, remain significant barriers. For instance, students from lower-income backgrounds, rural areas, or the Global South frequently lack reliable internet access or appropriate devices, limiting their ability to participate fully in online discussions. Privacy and security concerns are also prominent. Online discussion forums routinely collect personal and behavioural data, which can expose students to risks such as cyberattacks and data breaches. Growing student awareness and concern about how their data is collected, used, and shared, coupled with the absence of robust privacy policies or transparent data practices, can erode trust and deter active participation (Jiang et al., 2022). In summary, the most frequently cited technical issues in higher education online discussion forums are poor platform usability, persistent access barriers, and unresolved privacy and security risks. Addressing these challenges is essential to ensure that online forums can serve as inclusive, engaging, and secure spaces for academic discourse.

Recent research provides examples of how GenAI might potentially address some of the challenges. For instance, Sinha et al. (2024) argue that GenAI can assist "to efficiently manage, refine, and approve responses by facilitating interaction between student posts and a Large Language Model (LLM)" (p. 1). The authors elaborate that GenAI can support moderators by identifying off-topic, disruptive, or under-engaged posts while suggesting interventions to foster inclusive, respectful dialogue, and maintain organic discussion flow. Furthermore, AI agents could scaffold student thinking and prompt deeper inquiry by generating probing questions, suggesting resources, and modeling critical analysis.

AI-powered chatbots and sentiment analysis tools can provide real-time, empathetic responses, helping students feel supported and reducing isolation. GenAI can monitor discussion dynamics, flagging when students dominate or withdraw, and prompt interventions to promote equitable participation. By summarizing threads and highlighting key points, AI can also help students manage information overload and reduce cognitive fatigue.

However, these potential benefits raise important questions: Are the AI-suggested resources valid and reliable? Does the intervention/presence of AI agents alter the dynamics of discussion between human learners, and if so, how does this affect participants emotionally? These concerns are particularly relevant given that Henriksen et al. (2025), in their critical literature review on social-emotional learning and GenAI, claim that while AI can support "competencies like self-awareness, empathy, and collaboration, it also presents challenges like ethical concerns, algorithmic bias, and risks of depersonalization" (p. 1).

This leads to further questions about authenticity and human connection: Can AI truly enhance social presence and reduce feelings of isolation among human participants? Is AI a welcome addition to academic discourse? Our students were unequivocal in their response, clearly stating that they see little value in wasting their time in forums where AI talks to AI, underscoring the importance of maintaining genuine human interaction in educational discussions ... organic discussions that benefit

from “messiness”, inquiry and evolution of collective thought through individual propositions and inaccuracies that leave room for co-creation of new discoveries.

GRADUATE STUDENT PERSPECTIVES

Our doctoral students stated their concerns in a survey that is part of our program quality improvement. The EdD in Distance Education is an online degree. The doctoral students take five courses as part of their coursework before they complete their dissertation proposal and eventually their dissertation. These courses are fully online with the exception of the first course, which has an in-person orientation at the beginning. Each of these five courses has discussion forums. We asked doctoral students about their experience with discussion forums in their courses. To the more general statement “I find discussion forums are meaningful” students had a moderately low level of agreement (M=2.87, N=23) on a four-point Likert scale.

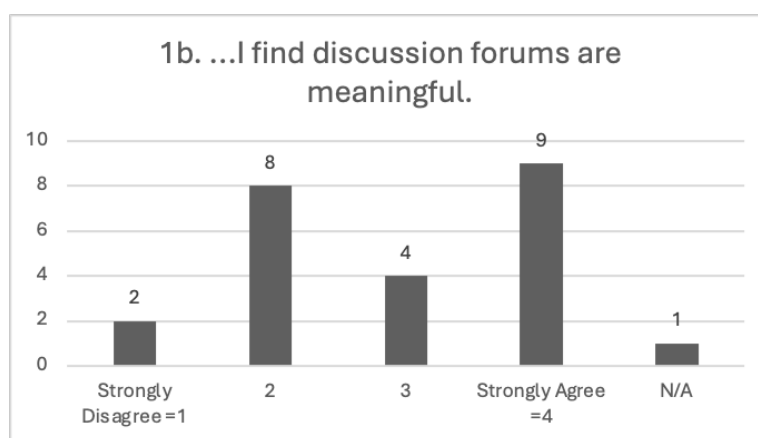


Figure 1. Graduate students: I find discussion forums are meaningful © The Authors

By contrast, most students agreed more strongly with the statement “I find synchronous sessions [via videoconferencing] are important” (M=3.21, N=24).

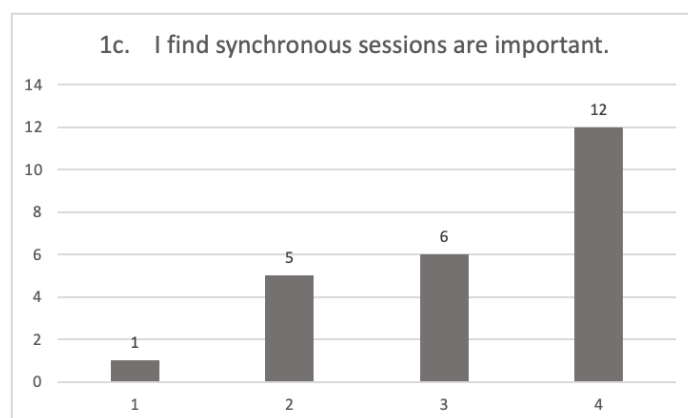


Figure 2. Graduate students: I find synchronous sessions are important © The Authors

Students were also asked an open-ended question to comment on their positive and negative experiences in discussion forums. Some students were very positive about discussion forums. They found it to be important spaces for summarizing and deepening their understanding of key readings and ideas. Other students lauded collaborative learning and community building with peers that

occurred in discussion forums. One student put it directly that discussion forums “*pushes me to critically analyze course material, consider alternative viewpoints, and articulate my own ideas*”. Others found the level of participation varied, they were time-consuming, often lacked depth and provided poor feedback. They were viewed as “*a time-consuming ‘hoop to jump through’ that do little to foster meaningful dialogue*”. The TLDR (too long; didn’t read) trend has also affected this space. Students disliked the “*very long-winded posts*” and wanted “*to make sure they were meaningful, concise*”.

The advent of Gen AI exacerbated some of these issues. Many students were confused about the value of discussion forums. They were concerned about peers who would “copy paste an AI response” which “effectively lowers the bar for even those who wanted to participate and foster debate and inquiry”. One student, using upper case, stated “*THEY ARE THE WORST. GET RID OF THEM ASAP. AI RESPONSES TALKING TO AI RESPONSES. DEATH TO THE DISCUSSION FORUM NOW*”. Several students expressed the lack of teaching presence (i.e., from the community of inquiry framework Garrison et al., 1999) in forums. AI responses increased concerns about instructor and student presence. One student suggested that perhaps AI makes discussion forums “a very outdated model of DE”.

It is notable that students identify the many purposes of discussion forums, recognizing a range of possible benefits and drawbacks. But GenAI magnifies the need to clarify for students what the specific purpose is for using discussion forums and types of DF activities. It requires overtly appraising and considering why DFs are being used and designing DFs accordingly. A recent study at UNISA (van den Berg, 2024) on AI using discussion forums found that “the absence of institutional guidelines on GAI (generative AI) raises questions about the necessity for clear guidelines and policies to ensure responsible and ethical integration in educational contexts”. To this end, we think it is important to have a DF purpose statement for different types of DFs activities. This provides some guidance about if and whether it is appropriate to use Gen AI within the DFs.

THE IMPACT OF GENAI ON DISCUSSION FORUMS

Discussion forums are premised on the belief that engagement, interaction, dialogue, reflection, communication, and community are important for learning. Historically there have been two major metaphors for learning: the acquisition and participation metaphors (Sfard, 1988). With acquisition, learning is conceived of as the act of gaining knowledge and developing concepts, where knowledge and concepts are assumed to be pre-existing objects). This is the vessel or banking metaphor of learning that Freire (1970) and others opposed. In the participation metaphor, learning is a process of becoming a member of a community (of practitioners or inquirers). In a community there is reciprocity, where students and teachers are co-creating knowledge. Using AI in discussion forums there is no reciprocity. AI is extractive of existing data and knowledge. The use of AI can undermine authentic engagement and dialogue within discussion forums, leaving students asking if there is a community participating in the learning.

Discussion forums are used for different purposes in online courses (Yu et al., 2021). These include summarizing and discussing course readings, sharing resources, sharing experiences and reflections, providing peer feedback, dialogue debriefing, analyzing case studies, and small group work. As GenAI becomes pervasive (O’Connell, 2025) it’s use in discussion forums can easily increase, changing the

original purpose of a forum as an exchange of ideas. Expectations must be clarified about the goals and value of discussion forums. Clarifying expectations will need to be dynamic given the accelerating changes in AI capability and use. There are no adults in the room with GenAI. Everyone is constantly learning. Given this reality, involving students is necessary in clarifying expectations and not just a pedagogical preference.

THE ROLE OF INSTRUCTORS AND PROGRAMME OUTCOMES

There are several responsibilities that need revisiting for asynchronous discussion forums to effectively continue forth. Professors need to support authentic student interactions and some of this authenticity comes from instructional forthright. As part of the online learning environment, acknowledging the uncertainty wrought by the constant churning and socio-political ties to GenAI names this shared emotional ambiguity. Such honesty nurtures trust (Brown, 2018) and

a bond formed in a collective group ideally develops mutual responsibility. This allows the community to share their values, goals, intentions, and vulnerabilities so they can ‘see’ each other for who they are; a community that they can trust and with whom they can share a safe space. (Palalas & Doran, 2023, para 58)

The responsibility to create and maintain trust within human-centric online learning environments is an ever-present requirement which requires ongoing instructor responsiveness.

Looking at multi-modal resources and learning activities that align with Universal Design for Learning (UDL) and inclusive equity practices are also ongoing responsibilities of instructional design and pedagogical implementation - including making these decisions explicit to the learners. The achievement of program outcomes through the embeddedness of mastery learning and deep learning (Beattie et al., 2010) entails another responsibility – again, drawing attention to these competencies when they organically appear and not only at formal junctures such as final assessments. Being conversational, naming or drawing out what works, both pragmatically and idealistically, is an ongoing, complicated conversation (Pinar, 2019), an ongoing exchange of ideas.

These responsible approaches model and nurture a growth mindset (Dweck, 2016) that has its base in curiosity, balanced between individual and group learning. Discussion forums need responsible nurturing, both pragmatically and idealistically, to strengthen the human-centric learning space.

RE-DESIGNING ASYNCHRONOUS DISCUSSION FORUMS

Purposefully applying research-based design for discussion forums continues to be an important strategy. From our CF conversations alongside our literature review, we suggest the following design considerations, some of which are long-standing suggestions (Dennen et al., 2007) but continue to hold merit.

- Meaningful communication: Ensure consistent and meaningful interpersonal communication (e.g., email, announcements, formative and summative feedback, forum postings).
- Quality content: Provide relevant, high-quality content that is well organized to support the development of discussion posts that move beyond summarizing and engage in deep learning “of the complex, composite and contingent nature of deep and surface learning

and its interrelationship within the teaching-learning environment” (Beattie et al., 1997, p. 1).

- Clarity: Articulate clear information, as this helps students understand what is required to be a successful learner (e.g., course materials, instructor expectations, and examples) (Dennen et al., 2007).
- Student concerns: Address individual student concerns (e.g., emotional tone, non-responsiveness, individual differences) in a discrete manner.

From our Critical Friends conversations which were informed by listening to our students’ feedback and survey results, we also determined the following suggestions:

- Authenticity: Encourage authentic, thoughtful participation and learner agency. As an instructor, bring forward the importance of human-centric learning that promotes “a sense of confidence and ease in participating in authentic interactions, communications, and creative activities within a secure shared learning space marked by connection and trust; that includes socio-emotional, cognitive, and physiological safety ” (Palalas & Doran, 2023, p. 15).
- Guidelines: Co-create with students clear discussion forum guidelines including GenAI use as part of a learning contract. At the beginning of a course, establish collective awareness of the knowledge gaps as students vary in their understanding and experience of GenAI. From this shared understanding the learning contract sets a level field for the group and can be revisited when necessary. This iterative process allows the contract to be a living document adaptable within a course or as understanding of GenAI develops over time.
- Rate of change: Acknowledge with learners the rate of change of GenAI, AIED and predictive AI, including its effects, and how overwhelm and uncertainty are shared experiences. Openly discuss this uncertainty. Learners need a safe place to express this uncertainty (e.g., how GenAI challenges our notion of citation, what constitutes plagiarism and authorship, etc.).
- Diverse methods: Integrate diverse methods for exchanging ideas and building community. This involves risk-taking by the instructor and the students. Identify these diverse methods as being risky and be prepared to fail or have minimal interest as good design would have conventional choices also available.
- Engagement: Balance convenience with meaningful engagement. Consider having fewer discussion forums but with the expectation of learners revisiting ideas (e.g., post in the initial forum at the end of the course to illustrate the learning undertaken, individually and collectively).
- Intentionality: Guide students with intention. Instructors need to engage in professional self-reflection to respond in situ to the unfolding of knowledge co-creation displayed by discussion forums. Use this self-reflection to make pedagogically sound decisions within the parameters of integrity and ethical use and be open to where and how students use genAI as part of forum posts may prove to be a rich learning experience.
- Ongoing AI learning: Learn more about GenAI, AIED, and predictive AI. As a faculty member be prepared to continue this learning and sharing as part of supporting students’ deep learning.

- Criticality: Model criticality of ed technology and GenAI, including the environmental costs and algorithm bias. Knowing your technological values enables decisions made with agency and not in compliance (Rothman, 2025).
- Curiosity: Engage in curiosity and care that explores when, why, and how to use GenAI as part of forums. For example, have a “non-AI forum post” followed by “AI must be used” and ask students to reflect upon the process, results, observations, and emotions experienced. Careful curiosity encourages deeper engagement with human-centric values and learning. Such approaches allow for declarative information exchanges, transactive learning, and sense making (DeSanctis et al., 2003).
- Reciprocal and relational learning: Foster awareness, practice, and understanding for reciprocal and relational learning. Learning online supports and illuminates co-learning and discussion forums are the premiere and archival artifact of this knowledge co-creation - help learners see these processes at work.
- Ongoing perspective sharing: Relate various teaching perspectives and experiences on an ongoing basis with trusted peers. In our CF discussions, we often left our online meetings feeling united in our shared practice problems, uplifted by engaging in our own deep professional learning conversations, and strengthened in the value of professional and personal self-exploration (Yuan et al., 2024).

CONCLUSION

From our CF discussions it was clear to see that online discussion forums are held to a high standard. Due to the veneration of the academic written word alongside the confines of a time-bound, linear LMS architecture, graduate students are caught in this online space that was conceptualized before the proliferation of GenAI.

Forums generally do not mimic the messiness of a live graduate seminar class that is more akin to a Roman marketplace with its practicality and its organic exchange of ideas and understanding. But for graduate online education, we suggest inviting some oral, organic messiness. Having guided, organized messiness allows for mistakes – it is okay to err in these learning places and students will not be punished through lower grades or mocked by classmates. Make explicit how guided messiness can be a helpful aspect of responding to GenAI encroachment. As part of human-centric learning spaces, instructors have the responsibility to nurture and build trust.

Social learning, connectedness, and community come from trust (Palalas & Doran, 2023). The feedback from our students revealed that GenAI had destabilized that trust. They did not trust the forum’s content as some of it was GenAI content posing as authentic student responses. Students did not trust themselves and questioned their integrity as learners in the forums as using GenAI is still seen as cheating by many universities. Consequently, students lost trust in the overall learning process. With the lack of trust in the forums themselves, and in the program learning overall, students were adrift in fear and hesitation.

Through this process of seeking programme and course quality improvement, we have realized that our graduate learners need a safe place within our courses for authentic communication and human-centric learning to occur. We aim to renew trust as we bring forward the benefits of engagement, participation, individual, and group learning through the richness of human-centric discussion forums. And with this trust, may students experience deeper learning.

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Transformative Effect of Generative AI on Tertiary Library Services in Higher Education

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ABSTRACT

The purpose of this paper is to explore the transformative effect of Generative AI (GenAI) tools on tertiary libraries' services to support higher education delivery in New Zealand. Tertiary libraries employ different approaches, tools, and technologies to improve the accessibility of course materials, research resources, and teaching support to ensure equity of education for people facing barriers to formal learning. Over the years, library technologies have evolved to include online catalogues, digital resources, and now artificial intelligence (AI). This paper is part of a study in progress that employs both qualitative and quantitative approaches to explore how GenAI tools are being applied in New Zealand tertiary libraries to support higher education. Because the study is still in progress and data collection is in its initial stages, this paper focuses on a literature review for information to support the discussions. The process followed to obtain the information from the literature is described. The paper discusses the difference between AI and GenAI, the specific GenAI tools that are being applied by libraries, how these tools are being used by tertiary libraries, and the transformative effect of the tools on the libraries' services. Empirical evidence from the main research will either support or challenge some of the ideas identified from the literature. The information in this paper will help readers understand the types of GenAI tools, their transformative effect on information generation and knowledge sharing, and the role tertiary libraries can play to control knowledge generation by GenAI.

Keywords

Transformative Effect; Artificial Intelligence; Generative Artificial Intelligence; Tertiary Libraries; Library Services; Tertiary Education; Content Generation; Knowledge Sharing, New Zealand

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INTRODUCTION

One of the essential pillars supporting online distance education is tertiary library services. Tertiary libraries offer a variety of support for both learners and staff. They employ different approaches to improve the accessibility of course materials, research resources, and teaching support to ensure equity of education for people facing barriers to formal learning. They also provide information literacy training and technological support for distance learners. Tertiary libraries provide these functions and support using different types of tools and technologies. Over the years, academic library technologies have evolved to include online catalogues, digital resources, and now artificial intelligence (AI) tools. The application of AI tools is not only having a tremendous impact on education but also transforming the support services that tertiary libraries provide for online distance education. While AI tools hold great promise for tertiary library services and online distance education in general, they are also identified to pose risks if not developed ethically and inclusively. For instance, the speed at which Generative AI (GenAI) tools are developing is raising a lot of questions about academic integrity in both students' assignments and faculty research. Overdependence on GenAI tools also appears to be affecting the development of critical thinking skills, limiting learning abilities (Bittle & Elgayar, 2025; Kosmyna et al., 2025). Kosmyna and colleagues' exploration of the neural and behavioural consequences of Large Language Learning Models (LLM)-assisted learning is a very important study that GenAI researchers need to think about seriously. This is because the whole idea of learning has, since time immemorial, followed a three-stage process of how to find information about a phenomenon, understanding the information to form knowledge, and applying the knowledge to develop wisdom. Understanding how this process worked pre-AI era and how it is working in the GenAI era will help modern researchers, learners, educationists, and education support institutions like tertiary libraries.

Integrating GenAI tools in tertiary education is fast emerging and appears to be fully embedded in the learning of most students. An Auckland University GenAI Student Survey highlights that most students use GenAI tools to help them explain difficult to understand concepts, summarise reading materials and lecture notes, generate ideas and outline structures in assignments, drafting emails, paraphrasing texts, analyse and interpret data, assist with writing assignments, and answer questions, etc. (University of Auckland, 2024). In the same way, GenAI tools are increasingly being used in academic research (Perkins & Roe, 2024). Both faculty and student researchers employ these tools to brainstorm and generate ideas, understand literature reviews, conduct data analysis, generate codes, and even write the research report.

As part of their support for learning, teaching, and research in higher education institutions, tertiary libraries not only provide resources in diverse formats, but they also create learning spaces and instructional support. In addition, they foster research by enabling access to publications, databases, and training. With the rise of AI and GenAI tools, tertiary libraries provide advisory support to students and faculty on the ethical use of these tools to avoid plagiarism and other legal issues. Because of this, almost all tertiary libraries in New Zealand have developed AI use policies on either their library's website or their institutional page to guide users. These policies explain to the library users what AI and GenAI tools are, provide specific examples of effective tools to use, and explain how to use them. With users becoming more and more adaptive to AI and GenAI tools, the library also needs to transform its functions to one that applies AI to be able to fully serve the needs of its users. Only AI-powered tertiary libraries can enhance user experience and efficiency in teaching and learning in

higher education in the modern era. Nevertheless, the specific GenAI tools that tertiary libraries themselves use in their functions, how they use them, and how these tools are transforming their services are unclear.

This paper is based on a study in progress that employs both quantitative and qualitative approaches to explore how generative AI tools are being applied in New Zealand tertiary libraries to support online distance education. The study seeks to understand the transformative effects of GenAI tool on tertiary library support services for online distance education. The research is guided by questions:

- What generative AI tools are being applied in Academic Libraries in New Zealand?
- How are these AI tools used to support teaching, learning, and research in tertiary education?
- What significant changes are generative AI tools causing in tertiary library services?
- How is this transformation by AI tools impacting tertiary library services and the librarians' role?

The discussions in this paper are supported by findings from the initial literature review, as data collection for the study is still in progress.

LITERATURE REVIEW

Generative Artificial Intelligence (GenAI) is revolutionizing knowledge (Adewojo et al., 2025). Knowledge is a crucial element in all human endeavours and the advancement of society. Gaining the right knowledge empowers people to understand their world, make informed decisions, and solve problems effectively (The Education Hub, 2021). In times past, people with knowledge about something were seen as smart, expert, and special. They were the go-to people for answers about the things they were knowledgeable about. Some educational games like “What-Do-You” were used to test people's knowledge in current affairs and understanding of phenomena. People use various methods to acquire knowledge. Knowledge acquisition methods can range from human to autonomous eliciting agents (Leu and Abbass, 2016). In the past, these methods involved simple processes like:

- Reading - books, journals, articles, and historical texts provided a wealth of information.
- Visiting sites of information to immerse oneself in the physical space, to learn about a phenomenon.
- Listening to lectures, audio recordings, and physical narratives of experts
- Engaging with news items
- Applying computer-based tools such as software programs to assist in organising, analysing, visualising, etc.

These tools and methods have evolved to develop advanced computer-based systems like Artificial Intelligence, and now, GenAI is gradually taking the power of knowledge generation from people. The powerful aura of people with memorable knowledge does not look impressive anymore. All that information seekers need today is a small digital tool (a mobile phone, tablet, laptop, Internet connectivity, AI software, and an understanding of where to find what they are looking for), and then they have the information they need to form the knowledge they are looking for. This highlights the crucial role that memory, knowledge, and understanding play in the learning process, as well as how

GenAI is revolutionizing the utilization of memory, application of knowledge, and the advancement of understanding.

Literature Search Process

Since this paper is using data from literature to support the discussion (as the main study is still in the early stages of its data collection procedures), it is important to describe the process followed to obtain the data from the literature to support the current discussion in this paper. Using the main research questions as a guide, specific aspects that define the topic were marked up as the focus areas for the literature search. Details of these aspects have been provided in Table 2.

Search Strategies

A combination of search strategies was employed, including single keyword searching, phrase searching, truncation, and Boolean logic search strategies. Emphasis was placed on key formats of information, including journal articles, research reports, e-books, and online resources were all considered for information. Table 1 shows samples of the keywords used.

Table 1. Sample Keywords

Artificial intelligence	Academic Libraries	Tools	Transform*	Role
Generative AI	Tertiary libraries	resources	change	tasks
Gen AI	University libraries	software	improve	work
Large language models	Polytechnic libraries	technologies	affect	job
Natural language processing				workflow

The screenshot shows a search interface titled "Search articles, books, journals & more" with a "Basic search" label. It displays five rows of search criteria, each with a search term box, a clear button (X), and a field selection dropdown (All fields). The search terms are:

- Row 1: "Artificial intelligence" OR "Generative AI" OR "Gen AI" OR "Large language model" OR "Natural language processing"
- Row 2: AND academic OR tertiary OR post-secondary OR universit* OR polytechnic
- Row 3: AND tools OR resources OR software
- Row 4: AND transform* OR chang* OR improv* OR affect*
- Row 5: AND role OR task OR work OR workflow OR job

Figure 1. Sample search strategy

Places searched include academic databases, focusing on the EBSCO suite of databases, the World Wide Web, using the Google search engine, and focusing on Google Scholar, Consensus, and the Semantic Scholar. The search resulted in thousands of information resources. Using the research questions as a guide and the CRAAP test model to evaluate the list of resources, 43 resources were shortlisted for review.

Table 2. Literature results for specific aspects of the study

Aspect	Literature
Defining AI and Generative AI	(Cox, and Mazumdar, 2024).
Generative AI in higher education	(Ahriz, Gharbaoui, Benmoussa, Chahid, and Mansouri, 2024). (Grote, Faber, and Gasparini, 2024). (Okunlaya, Abdullah, and Alias, 2022). (Paiste and Siago, 2025).
Generative AI in Libraries	(Aboelmaged, Bani-Melhem, Ahmad Al-Hawari, and Ahmad, 2025). (Adewojo, Amzat, and Abiola, 2025) (Borgohain, Bhardwaj, and Verma, 2024). (Chigwada and Pasipamire, 2024). (Freeman, et al., 2024) (Haffenden, Fano, Malmsten, and Börjeson, 2023). (Hussain, 2025). (Ibrahim, 2024). (Islam, 2025) (Malakar, Manavalan, Jain, P., and M.S., S. 2025). (Molaudzi, and Ngulube, 2025). (Monyela, and Tella, 2024). (Mosha, 2025). (Ru, and Tang, 2025). (Rabatseta, Modiba, and Ngulube, 2024). (Semeler, et al., 2024) (Sonawane, et al., 2024) (Tsekea, and Mandoga, 2025). (Vogus, 2023).
Librarians' Perceptions and Application of AI	(Bøyum and Khosrowjerdi, 2025) (de Leon, Flores, and Alomo, 2024). (Elsayed, and Mohammed 2025). (Kılınç, and Keçecioglu, 2024). (Lund, Omame, Tijani, and Agbaji, 2020). (Ogwo, Ibegbulem, and Nwachukwu, 2023). (Safana and Fari, 2024).
AI adoption and intention of use in Libraries	(Fang and Alam, 2025). (Gupta, 2025). (Gupta, 2024b) (Lund, 2025). (Reshma, Rekha, 2024). (Sang, 2025).
Transformative effect. Meaning Applications, and impact	(Khan, Gupta, Sinhababu, and Chakravarty, 2024). (Narayanan, 2024). (Shee, n.d.). (Yang, Ding, Chen, and Ji, 2024).
Research on AI Tools in Academic Libraries	(Wang, 2025).
New Zealand Tertiary Libraries and AI	Websites of various academic libraries Open Polytechnic Library (2025a) Victoria University of Wellington Library (2025) Otago University Library (2025) Auckland University Library (2025) University of Canterbury Library (2025)

AI and GenAI

Traditional AI performs specific tasks using pre-defined rules, while generative AI creates new content based on patterns learned from data. According to Cox and Mazumdar (2024), AI is not one technology but a bundle of technologies with general applications across many sectors of activity. AI is a tool, and it is very powerful in terms of how fast it can find, organise, and arrange information to suit users' needs. However, its effectiveness depends on how it is used. That is why it is a tool, a machine to aid the information acquisition work of the knowledge seeker. This tool is a set of computational techniques that allow machines to perform tasks that in the past have required human intelligence (University of Otago Library, 2025). Others also see it as "a collection of technologies that combine data, algorithms, and computer power" (European Commission, 2020, p. 2). The user of such a tool, therefore, needs an understanding of its strengths, weaknesses, opportunities, and threats. AI users need the skills to question the information this tool provides and be able to identify any ethical implications of using that information.

Generative AI (GenAI) is an advanced form of AI for content generation. It is a type of artificial intelligence that generates new content from existing data to create text, images, audio or video based on predictive language patterns. Examples of GenAI include ChatGPT, DALL-E, Gemini, Claude, as well as writing assistants like Grammarly and QuillBot for Chrome (Open Polytechnic of New Zealand, 2025b). GenAI utilises massive datasets and large language models to produce original output. Both GenAI and AI (often called "traditional AI") use machine learning algorithms to obtain their results. However, their goals and purposes differ. GenAI intends to create new content while AI does whatever the coder wants. The tasks of AI are, therefore, broader and deeper, limited only to what the coder wants to do with it. In essence, AI has the ability to perform tasks that typically require human intelligence. Generative AI, in contrast, is a specific form of AI that is designed to generate content (Jungco, 2024).

AI in Tertiary Education

The advancement of AI and GenAI is a testament to the rapid evolution of Information and Communication Technologies. This evolution has created a pressing need for higher education institutions to modernise their IT systems. The use of chatbots has considerable potential for universities to improve the efficiency of digital services offered to students (Ahriz, et al., 2024). AI is transforming education, and academic librarians are the change agents, the catalysts for this transformation (Paiste & Siago, 2025). Grote, Faber, and Gasparini (2024) recognise that AI will drastically influence and change the working methods of scholars and researchers. They used their study to offer some new perspectives to tertiary libraries on the challenges and opportunities the advancement of AI poses for supporting learners in higher education. They recommend integrating AI-related topics into existing educational resources and creating arenas for sharing experiences and knowledge with relevant partners both within and outside the university.

Both students and academics use various AI tools for different purposes. The use of AI in education is met with different responses by different institutions. While some institutions do not accept any use of AI by students in their assessments, other institutions allow some level of use. Academic institutions have, therefore, developed policies to guide their students on how to use. The Open Polytechnic of New Zealand, for instance, does not support the inappropriate use of GenAI services. While students can use AI to support their research for their assessments, they must not present any output from any

AI services as their own work in their assessment submissions. Students must use their own words. They must reference correctly if they paraphrase or quote from a source such as a textbook, website, or AI service. If a student submits an assessment using content copied directly from an AI service without acknowledgement, it is a form of academic dishonesty. This may result in serious academic penalties (Open Polytechnic of New Zealand, 2025b). Other tertiary institutions have similar policies with variations to suit their contexts. Usually, to detect inappropriate use of AI in students' assessments and ensure academic integrity, institutions use web-based similarity checking tools like Turnitin. Nevertheless, some AI tools have advanced to levels beyond the detection capabilities of Turnitin. Thus, some tertiary institutions are carefully studying ways of supporting students' use of AI tools in their studies.

In 2024, for instance, the University of Auckland surveyed GenAI usage among its students. They found that 80% of their students use GenAI tools for their studies every week. The students explained that they used these tools for explaining difficult to understand concepts (70%), summarising reading materials and lecture notes (47%), generating ideas or outline structures in assignments (46%), drafting communication (e.g., email to lecturer) (33%), paraphrasing text (29%), analysing or interpreting data (24%), assist with writing assignments (24%), answering assignment questions (9.5%) and other (14%). These behaviours of Auckland University students around AI use may not be very different from the behaviour of their colleagues in other universities. Academic institutions are, therefore, working with students to see how best they can be supported to effectively use AI tools appropriately and ethically to advance their studies. When asked how they can be supported, Auckland university students for instance, suggested, clearer instructions on how to use Gen-AI tools in assessments without breaching Academic Integrity (66.9%), how to use GenAI tools in assessments – taught in workshops (35.6%), how to use GenAI tool in assessment – taught in class (33.6%), more GenAI tools (10.2%) and no additional support needed (19%).

This is where the services of tertiary libraries become very important to support the learners on how best they can use GenAI tools appropriately. Tertiary libraries already teach students about the best ways to reference resources ethically to avoid plagiarism. So, if learners are calling for support to use AI tools, there is no better team in the institution to help them with this than tertiary librarians and learning support centre personnel. But, how well placed are the learning support personnel themselves in the use of the GenAI tool in their own work? What specific tools are tertiary libraries themselves using to provide this support for students and staff? This is the reason why this study seeks to understand the GenAI tools tertiary libraries are using and how these tools are transforming their services.

AI Tools in Tertiary Libraries

AI in library work is very much in its infancy (Cox & Mazumdar, 2024), but they are perceived to pose a number of ethical issues (Cox, 2022), and there is a recurrent fear that AI may in some way replace human librarians' work. Nevertheless, the uptake of various GenAI tools by tertiary libraries is increasing rapidly because of the recognition of the pervasive nature of AI in all aspects of tertiary education.

Aboelmaged et al. (2025), for instance, observe that the role of Chatbots in libraries keeps expanding and acquiring more experience. Chatbots are replacing some of the library services that humans conventionally perform. Adewojo and colleagues (2025) also highlight that AI-powered libraries are

the way to enhance user experience in Nigeria. They emphasize the transformative potential of AI in addressing immediate challenges and unlocking enduring benefits for users in the future. In the view of Chigwada and Pasipamire (2024), Large language models (LLMs) have ushered in transformative information retrieval, organisation, and dissemination possibilities. Users of tertiary libraries in Zimbabwe are aware of GenAI tools like ChatGPT, and they use these tools to generate content. However, they found users to be less informed, biased in their use of the tools, and they do not follow ethical principles. Tertiary libraries are, therefore, recommended to train both students and educators on the ethical use of LLMs and the introduction of artificial intelligence literacy programmes.

In Georgia, Freeman et al. (2024) observe that diverse practitioners across academic, school, and public libraries have experienced AI in libraries, and they provide accounts on how effectively these tools can be integrated into a library community. While middle schools are pioneering AI-enhanced educational experiences in collaboration with teachers, Universities are also leveraging ChatGPT for streamlined cataloguing practices. These initiatives, according to Freeman and colleagues, exemplify the transformative potential of AI in enhancing efficiency and expanding service capabilities.

The transformative power of AI can be seen in all fields affected by the constantly evolving technological landscape. When it comes to the library area, Gupta (2024b) observes that libraries have been focusing on experimenting with emerging AI technologies to innovate their services. Gupta encourages librarians to experiment and use their expertise in current generative AI technologies to test out future ones and adopt the more useful tools. Lee (2025) suggests some 34 useful current ground-breaking AI tools for librarians that she believes will change libraries forever.

AI Tools for Academia and Research

- Research Rabbit - Librarians can use Research Rabbit to uncover the latest and greatest ideas that will truly transform our libraries! Stay on the cutting edge of innovations in library science so we can provide patrons with the best possible resources and services.
- PuzzleLabs - Curating knowledge is at the heart of what librarians do. PuzzleLabs can help us organize information into treasure troves of wisdom that will inspire curiosity and learning for our patrons of all ages.
- Scite - Facts are friends to librarians! Scite ensures we always have trustworthy citations to back up the information we share. This helps us provide accurate, credible answers that patrons can depend on.
- OpenRead - AI text analysis tools allow librarians to gain new insights into literary works and reading materials. These insights can be used to develop novel programs, discussions, and activities that enrich patrons' reading experiences.
- Cohesive - Cohesive is an AI editor that lets you create, refine, edit, and publish high-quality content without worrying too much about prompts. You can create scripts for YouTube videos, Instagram captions, content rephrasing, Facebook posts, story generation, and so much more.
- Consensus - Consensus helps librarians provide patrons with information backed by peer-reviewed research. This ensures the accuracy and credibility of the knowledge sharing, building trust in the library as an authoritative source.
- Lateral - Lateral allows librarians to collaborate and share knowledge with other information professionals. This fosters a community-driven approach that enhances research capabilities and keeps libraries innovative.

- EndNote - EndNote automates citation management for librarians, saving time and effort when researching programs, grants, and other projects. Accurate citations also ensure information shared is properly attributed.

AI Tools to Enhance Patron Experiences

- Botsonic - Chatbots allow librarians to be in two places at once! By training a bot with our library's knowledge, we extend our personal assistance beyond the front desk. Patrons can get quick answers around the clock to basic questions, freeing up librarians to tackle more complex research needs.
- QuickChat - A library chatbot can handle basic inquiries, freeing up librarians to focus on in-depth research and personalized assistance. AI chatbots provide patrons with around-the-clock access to information, improving the self-service experience.
- Copyscape - Librarians can use Copyscape to ensure library materials are original and do not contain plagiarized content. This protects the library's integrity and sets a good example for patrons.

AI Tools to Accelerate Productivity for Librarians

- MEM - An AI assistant can be a librarian's secret weapon! With MEM's help, we can juggle a million tasks, remember every detail, and make the most of each precious minute. This means we have more time to devote to helping patrons directly.
- Dante - An AI editor can help librarians eliminate typos, inconsistencies, and other errors before they make it to print. With Dante's help, we can create library communications that are polished, professional, and mistake-free - projecting a positive image for our institutions.
- AndiSearch - An intelligent search assistant can help librarians efficiently navigate the vast amount of information needed to answer complex patron questions. AI-guided research expedites the discovery of relevant resources and knowledge.
- ChatPDF - ChatPDF allows librarians to quickly summarize lengthy research papers without reading them in full. This saves time and helps provide patrons with concise, relevant information to support their work.
- Perplexity AI - Perplexity AI can assist librarians in staying up to date with the latest research trends. This ensures library resources incorporate current knowledge and information to meet patrons' evolving needs.
- AudioPen - AudioPen can transcribe audio recordings for librarians, saving time and effort. This makes spoken content like interviews, lectures, and oral histories searchable and accessible for patrons.
- Cataloging.ai - Cataloging.ai can generate metadata for library items, saving librarians from the tedious task of manual data entry. This frees up time for more valuable tasks that directly serve patrons.
- Flixier - Flixier can transcribe audio/video materials for librarians, making the content searchable, shareable, and accessible. This allows spoken content to reach and benefit a wider audience.
- Quillbot- Librarians are only as good as the words we put on the page. Quillbot helps ensure our writing is clear, concise, and correct - whether it's for signage, newsletters, or

grant proposals. Well-crafted communications help us effectively engage and inform our patrons.

- Grammarly - Librarians spend their days writing for patrons. Grammarly helps make sure that writing is polished and professional. By eliminating embarrassing mistakes, we build trust that patrons can rely on the information we provide.

AI Tools To Aid Marketing And Promotions For Librarians

- Fable Fiesta - Storytelling is magic, and Fable Fiesta can help librarians weave spells that cast imagination on our youngest patrons. With AI assistance, we can create captivating characters and worlds that will spark children's creativity and love of reading.
- Copy AI - AI content tools allow librarians to spend less time writing from scratch and more time curating and customizing generated text. This means we can create more marketing materials, instruction guides, and handouts - all of which help patrons make the most of our resources and services.
- Canva AI - Librarians can use Canva's AI features to quickly design eye-catching visuals for marketing library events, programs, and services. Beautiful graphics and images help attract patrons and increase engagement.
- Craiyon - Craiyon allows librarians to transform abstract concepts into vivid illustrations that bring library collections, stories, and themes to life. AI-generated images can enhance newsletters, handouts, and signage.
- AnyWord - AnyWord can help librarians write catchy headlines, compelling social media posts, and engaging descriptions that attract more patrons. AI-assisted copywriting ensures library communications stand out and motivate action.
- Midjourney - Librarians can use Midjourney to create interactive experiences that immerse patrons in the world of library collections. AI-generated art and visuals can enhance storytimes, book discussions, and exhibits - sparking imagination and learning.
- Lexica - AI - AI art tools allow librarians to explore new ways of visualizing and representing library collections. AI-generated images inspired by library materials can add aesthetic appeal to communications and spark creative thinking.
- Chatsonic-AI -An AI tool like Chat GPT but enhanced to stay on top of current and recent events. Aids in easy access of information and inspiration for librarians aiming on incorporating creative strategies in promoting their library services.
- Tableau - Data visualization tools help librarians transform complex statistics into easy-to-understand graphics and dashboards. This allows library stakeholders to make more informed decisions based on data, leading to improved services, operations, and outcomes.

In her concluding thoughts, Lee advises that AIs are tools for librarians that hold great potential for improving library functions and services in the future. However, the risks these tools pose are also real. Risk in using AI can be serious if they are not developed and applied ethically (Lee, 2025). Following this advice, tertiary librarians can take advantage of the power of this emerging tool and promote those that enhance user experience and empower professionals. The tools are many and varied, and librarians can use those that work for their purpose and supplement their functions. The tool cannot take the place of human capabilities. They can only augment what human does. Finding the intersection between AI, GenAI, and human capabilities can create a great connection between

machine and human intelligence that can lead to a phenomenal experience for both users and professionals in tertiary libraries.

Generative AI in New Zealand Tertiary Libraries

The literature shows that AI tools are being applied in various aspects of the library's support functions, including teaching and research, AI tools for enhancing user experiences, AI tools for accelerating productivity for librarians, AI tools for library marketing and promotion, etc. However, the specific AI tools librarians are applying for their functions in New Zealand tertiary libraries are unclear. The research in process, on which this paper is based, will help us to find out.

In New Zealand, the Library and Information Association of New Zealand Aotearoa – LIANZA is the main professional association body supporting all librarians. LIANZA has a special interest group for tertiary librarians (LIANZA TEL SIG). This group has been providing professional development workshops for tertiary librarians. The group also takes part in discussions on the NZLibs listserv. Ideas from the discussions on these platforms and workshops prompted the research on which this paper is based. Specific views from librarians on the specific GenAI tools being applied and how they are applied in New Zealand tertiary libraries will be discussed in that research report. For now, ideas discussed in this section of the paper are based on discussions from the LIANZA TEL SIG webinars on YouTube videos and the listserv, as there is limited published research on the specific GenAI tools being used in New Zealand tertiary libraries. A May 29, 2024, TEL SIG Webinar presented by Nicolas Hansen explained what AI is in academic libraries and what librarians need to know about its limits. It also discussed what GenAI tools can do, what they are as of yet unable to do, and the unique challenges they present to libraries (Hansen, 2024). Applications of Generative AI tools in New Zealand tertiary libraries are rife, but unstandardised. There is no evidence in the literature of tertiary libraries adopting specific GenAI to streamline their functions. Individual librarians appear to have differing levels of AI application skills, and based on their level of skills, they select their preferred AI tools individually to perform their duties. For instance, in the same tertiary library, one librarian may prefer to use ChatGPT, or the AI function embedded in Google, to support their search assistance for a user. Another librarian may prefer to use Research Rabbit, PuzzleLabs, Open Read, or Scite to supplement a user's searching, or use Botsonic, QuickChat, or Copyscape to enhance the user's experience, depending on the librarian's awareness of the AI and their ability to use them. But the tertiary library itself may not have officially adopted those specific AI tools for all staff to use.

Transformative Effect

Whether the tertiary library has officially adopted an AI tool or the individual librarians are using their own preferred AI tools, there is some form of AI tool usage in tertiary libraries, and they are transforming the functions of the libraries. This transformation has a significant effect on the whole tertiary library structure. In this paper, transformative effect is used to mean a profound, significant change that alters tertiary libraries' functions fundamentally. This change has a positive and lasting effect, and it occurs not only in the nature of their services provided, but also in the form of the function and general perspectives. Other people use alternative words like Transformational impact, Revolutionary impact, significant change, profound influence, catalytic effect, and radical alteration to describe the same concept (see Wisdom Library, 2025).

In 2024, Narayanan critically examined the impact of GenAI in libraries, education, and research, focusing on the advantages it offers, such as enhanced information accessibility and personalized

learning experiences, while also addressing its limitations and ethical considerations. According to Narayanan, “the advent of Generative AI in library services marks a significant shift in the information management and dissemination paradigm. This technology's potential to revolutionize library operations spans various aspects, from enhancing user interaction to streamlining administrative processes” (2024, p. 288). The main areas of library functions that Narayanan believes GenAI can cause significant transformative effect in include:

- Reference service - automating responses to routine queries, these tools can significantly enhance the efficiency and accuracy of reference services, enabling librarians to focus on more complex, nuanced inquiries. This shift can improve user experience, offering prompt and reliable assistance, especially during peak hours or outside the library's standard operating times
- Information literacy services – traditionally, skills included effectively locating, evaluating, and using information. However, with the emergence of generative artificial intelligence (AI), a paradigm shift is happening in how information literacy is taught and learned. generative AI can create new, original content based on learned data patterns, revolutionizing how we teach information literacy.
- Library technical services - Generative AI tool like ChatGpt's advanced algorithms are proficient at handling the complexities of library classification systems. The implementation of ChatGPT in libraries also promises dynamic updating of categories. Given the constantly evolving nature of knowledge and the emergence of new subjects, ChatGPT's ability to adapt and modify classification categories ensures that library systems remain current and comprehensive (Narayanan, 2024, p. 289).

With the fast rate at which GenAI tools are developing, one will not be surprised to find out how these GenAI tools are causing significant transformative effects on other functions are services in tertiary libraries. This makes the research on which this paper is based very important indeed for the tertiary library group of New Zealand.

DISCUSSION

The literature review brings out important points to discuss, including how GenAI is transforming information literacy, knowledge sharing, and how these processes will look for humans in the future.

Gen-AI and the Information Literacy Process

As clearly explained in the literature, GenAI is transforming the information literacy process. The process of defining an information need, identifying relevant sources and repositories to search for information about the defined need, evaluating the relevance and credibility of the information retrieved, and using it ethically can be a horrendous process for the human mind. The process also takes a lot of time, resources, and effort to complete. So, having GenAI tools simplify this process for human beings is a significant shift. Nevertheless, there is a difference between the intelligence of AI vs human intelligence. Even though Generative AI tools were developed to mimic human intelligence, their advance make many people scared of how the intelligence of AI will outsmart humans in the future. GenAI operates objectively, not subjectively. While they may be able to simplify the information search and use process, their intellectual processes and learning models depend on the data that the human users provide. Tertiary librarians still need to educate their users to be careful and not to be

overly reliant on the intelligence of AI. They need to still apply their subjective analysis to the information GenAI provides them during their information literacy process.

Knowledge Sharing and Gen-AI

The information literacy process is to help people develop the skills they require to find the information they seek. The information they find is to enable them to develop knowledge and understanding about phenomena. Once the knowledge about the phenomena is applied, people develop wisdom. Thus, the three elements of knowledge, understanding, and wisdom are essential for information seeking and problem solving in any human endeavour. Before the advent of AI and GenAI, people who could find information and had knowledge about phenomena were considered smart. Now that AI has a tremendous ability to find a huge amount of information and acquire significant knowledge with speed and in less time than human capabilities, AI tools are considered to be smart, looking smarter than humans. However, while AI is good at finding what it wants to find, it is incapable of knowing whether what it has found contains stuff it doesn't want. Thus, it is knowledgeable and smart but does not have to wisdom to distinguish between what is wanted and what is not wanted. It behoves the human information and knowledge seeker to apply their wisdom to analyse the information and knowledge that GenAI provides to shift what they do not want from the lot. Tertiary libraries' staff need to let their user understand this difference, so that when they receive any information from GenAI, they will take their time to look for what they do not want, rather than taking everything to be the truth and using them carelessly.

AI is a Tool; Gen-AI is an Expert

In the traditional information-seeking and knowledge-sharing process, people who had knowledge in an area or a field of study and had applied that knowledge several times to gain wisdom in the phenomenon that they talk about were considered experts. Such experts include doctors, lecturers, nurses, philosophers, gurus, rabi, etc., They could provide answers to any questions they are asked. But they used certain tools to help them acquire their knowledge. They read books and historical documents, they talk to people, visit sites to gain first-hand experience, observe, and practice to generate the knowledge, understanding, and insight that they possess on the subjects they are experts in. When we bring the traditional process to the AI era, one can say that AI is a tool to find information and knowledge, just like the traditional tools that the expert used to apply. It applies large data models to go as wide and deep as possible to bring you the information you need to generate your content and understanding. GenAI, on the other hand, seems to have been built to already have the understanding of the content you need, and they go straight to generate the exact content for the user, just as a guru or an expert will answer and student's or a disciple's question. The interesting part of this comparison (between GenAI and Gurus) is that GenAI operates on the same principle as a guru, or rabi, or any other expert operates when it comes to generating content and sharing knowledge.

The way experts share knowledge with their disciples or students is different from the way they share knowledge with the general public. Disciples are loyal to the expert; they have committed something that cost them to be with the expert. This could be their time, a fee, a sacrifice, or a dedication of an aspect of their lives just to get the knowledge they seek from the expert. The general public does not really care about the expert or the guru and their information. As a result of this, experts give knowledge that has deeper meaning to their students than what they will give to the public. Take for an example, an expert medical practitioner, who is giving a public talk on healthcare and when they are talking to

a patient who has paid a consultation fee to come to the office for advice. The knowledge he will give to the two audiences will not be the same. In the same way, if you take a rabbi, talking to an audience with diverse believers, and when he is talking to his disciples who have committed time and sacrificed their work, families, and believe to come to the synagogue to listen. The knowledge he will give to the two audiences will not be the same. This principle works the same way when engaging GenAI. It generates the content it thinks we want, just as it will generate content for anyone who asks. But those who sacrifice time and effort to study the content it has generated will know the details they do not want from the rest.

The Future of GenAI and Knowledge Sharing

GenAI generates content by using AI as a tool to collect data from different sources. There are closed sources of information and open sources of information. Closed sources require subscription and paid access. Open sources are free. Now, a lot of content is being published in open-access sources. Some of these open-access sources have questionable credibility. AI-generated contents are published in open sources. Many people do not trust AI-generated content, including text, videos, and images etc. With the proliferation of AI-generated content and the GenAI tool not able to cite data from closed sources, there is a fear that these tools will start citing their own information and put them back into the open source. After a while, when AI starts to cite its own generated questionable information, how would humans distinguish between truth and false information? Tertiary libraries has a role to educate their users on these aspects.

CONCLUSION

The study sought to understand the transformative effects of the GenAI tool on tertiary library support services for online distance education. Ideas from literature analysis have helped to understand that AI-powered tertiary libraries can enhance user experience and efficiency in teaching and learning in higher education in the modern era. The specific GenAI tools that tertiary libraries themselves use in their functions, how they use them, and how these tools are transforming their services have been discussed. Tertiary libraries use GenAI tools to support academic and research, enhance users' experience, accelerate productivity for library staff, and aid marketing and promotion of the library and the librarians.

The difference between AI and GenAI tools has also been discussed. AI is a set of computational techniques that allow machines to perform tasks that in the past have required human intelligence by combining data, algorithms, and computer power, AI can perform tasks that typically require human intelligence. Generative AI, in contrast, is a specific form of AI that is designed to generate content. It generates the new content from existing data to create text, images, audio, or video based on predictive language patterns. Examples of GenAI tools used in ChatGPT, DALL-E, Gemini, Claude, as well as writing assistants like Grammarly and QuillBot for Chrome.

The literature did not show evidence of the official adoption of GenAI tools by New Zealand tertiaries. However, evidence from workshop discussions on YouTube and online group discussions shows that individual librarians are using different types of GenAI tools to support their work in New Zealand tertiary libraries. This observation has prompted the study on which this literature review paper is based. Empirical evidence may prove to support or contrast what the literature reveals.

The transformative effects of the use of GenAI could be seen in various ways, including how they are significantly changing the information literacy process. The traditional information literacy process takes a lot of time, resources, and effort to complete. So, having GenAI tools simplify this process for human beings is a significant shift. Another area where the transformative effect of GenAI is felt is in the information-sharing process. AI has a tremendous ability to find a huge amount of information and acquire significant knowledge with speed and in less time than human capabilities. AI tools are smart, looking smarter than humans. However, while AI is good at finding what it wants to find, it is incapable of knowing whether what it has found contains stuff it doesn't want. AI is smart, but not as wise as humans. It, therefore, behoves the human information and knowledge seeker to apply their wisdom to analyse the information and knowledge that GenAI provides to shift what they do not want from the lot.

AI is a tool. GenAI is an expert. When experts give knowledge, they reserve the golden nuggets for those they consider committed disciples. The germ of the content GenAI provides can, therefore, be obtained at a cost of some form. Tertiary libraries, therefore, need to educate their users to understand the commitment involved in teasing the value from the content generated by GenAI. This will help to control the content generated by GenAI. As AI keeps publishing and referring to itself, if users do not exert this control, it will be difficult to ascertain the truth in the information and knowledge generated.

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Sustainable Development Goals (SDGs)

This study is linked to the following SDG(s): Quality education (SDG 4) and Industry, innovation and infrastructure (SDG 9).

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Opening Doors on ODFL With ‘Video Chat’: Adding Synchronous Academic Support To Asynchronous ODFL Delivery

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ABSTRACT

This paper explores the development of bichronous pedagogy by adding an aspect of synchronous academic support, “office hours” to asynchronous ODFL with the aim of enhancing accessibility and openness, without compromising scalability. The study contributes to a gap in research where most studies on bichronous pedagogy are concerned with adding asynchronous elements to existing synchronous delivery, this study explores the opposite context, providing an example for asynchronous ODFL.

The study, undertaken at the Open Polytechnic of New Zealand, tests the hypothesis “If ākonga (learners) are offered virtual “Office hours” - individual kanohi ki te kanohi (face to face) appointments with their course facilitators - their engagement, outcomes, and feelings of satisfaction will increase.” Expanding an earlier single discipline small-scale case-study, the paper describes the purpose, scope, and framing of the project, details the responsibilities of the Academic Staff involved, and describes the practical implementation of “Office Hours”. The study utilizes mixed method data collection, drawing on the narrative experiences of Academic participants at the mid and end points of the study duration. Narrative data is drawn from focus group wānanga (open discussion) and a survey implemented with participants. Quantitative data compares ākonga engagement and achievement between those who do use office hours with those who do not. Findings describe the perceived benefits of “Office Hours” for kaimahi, ākonga, and for the wider ODFL context, and detail any experienced disadvantages.

Keywords:

Bichronous pedagogy; ODFL; Technology enhanced education; Academic support; social presence; equity

This paper is published in full elsewhere.

The Culminating Integrative Assessment in Initial Teacher Education: Challenges and Benefits

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ABSTRACT

This paper explores the challenges and benefits of a new form of assessment, the Culminating Integrative Assessment (CIA), recently introduced and mandated for all Initial Teacher Education providers in Aotearoa New Zealand. The CIA requires pre-service teachers demonstrate evidence that they can apply the knowledge, capabilities, and skills they've learned during their programme to an authentic teaching situation(s), also referred to as a "complex puzzle of practice", that relates directly to their professional work in the school sector they are entering. This assessment is presented orally to a panel which, ideally, includes at least one external stakeholder. Open Polytechnic Initial Teacher Education, Primary and Secondary, implemented the CIA for the first time in 2023, and again during 2024, across its one-year Graduate Diploma programmes. As a newly introduced requirement, there is little current research available on this subject. This initial study gathers qualitative insights from the reflections of Academic Staff in Initial Teacher Education (ITE) Primary and Secondary programmes, on their first experiences of implementing this assessment, with a view to understanding its efficacy as an assessment that evidences the integration of theory and practice, and how, as a mandated form of assessment, it demonstrates cultural responsiveness. Through thematic analysis, the research explores and describes the challenges and benefits of implementing the CIA and the findings contribute to the wider literature related to "authentic assessment."

Keywords

Culminating Integrative Assessment (CIA), puzzle of practice, authentic assessment, teacher inquiry, reflective practice, self-study, benefits, challenges, Teaching Council, Initial Teacher Education.

This paper is published in full elsewhere.

Predictive Diagnostic Evaluation: Strategy for Student Retention in Basic Education in Brazil

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ABSTRACT

The paper describes a project of a predictive diagnostic system aimed at combating school dropout, being developed at the Education Department at the Catholic University of Brasília (UCB). With the support of the Research Support Foundation of the Federal District, the project aims to create a prototype based on artificial intelligence (AI) to monitor and intervene in students' trajectories, ensuring their retention in school. Variables influencing school dropout are analyzed with the aim of providing elements for the creation of a predictive system. The focus is on the Public Education network of the Federal District, where stages such as data collection and analysis, strategic interviews, tool development and training, testing, and diagnostics are being developed. The results include the possibility of systematically monitoring students' trajectories and planning institutional interventions in Basic Education. The system is designed to identify risk factors and provide information to school managers, allowing them to find solutions to school dropout. Socioeconomic data, attendance, and academic performance are considered to create an educational panorama. AI and machine learning techniques are fundamental for the analysis and generation of detailed reports that assist in strategic decision-making. In summary, the implementation of a predictive system is a crucial strategy to ensure student retention and to promote inclusive and quality education.

Keywords

Predictive Artificial Intelligence. Student Dropout. Educational Management

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INTRODUCTION

This study aims to develop a systematic analysis and produce a prototype, as a technological tool equipped with Artificial Intelligence, capable of outlining a preventive diagnosis for student dropout in public schools of the Federal District, specifically concerning the final years of elementary school. Through the studies produced and by using the computerized tool, it will be possible for schools to systematically monitor risk indicators of student dropout and evasion, as well as to act to mitigate them.

Studies on student dropout and evasion have been consolidated over the years, addressing the topic from different points of view and converging on the finding that it is a problem of great dimensions at all educational stages and modalities.

The topic is particularly concerning when focusing on Brazilian Basic Education, as its occurrence seems to accentuate the many historical social and economic inequalities in the country and, perversely, contribute to perpetuating them. Data such as those from the national Basic Education censuses show high rates of student dropout, especially at times considered transitions between stages, for example, at the end of the literacy process (3rd year of elementary school), at the end of the initial years of elementary school (6th year), and in the transition from elementary to high school (9th year) (Brasil, 2020).

In different ways, studies on dropout, evasion, and retention highlight the importance of considering external and internal, economic, psychological, didactic-pedagogical, and infrastructure factors. In addition to these factors, it is important to put into perspective that, in the case of addressing the topic in the second stage of elementary and high school, it is also a study about different youths and their complexities, as referenced in the National Common Curricular Base - BNCC (Brasil, 2018).

Measuring data and proposing indicators about dropout (after it has occurred) are, without a doubt, important measures for understanding the real national and local scenarios in which we find ourselves. However, from a managerial and pedagogical point of view, it is considered even more relevant to establish actions to confront the problem, in order to prevent dropout from occurring and to contribute to the engagement, motivation, and retention of students. It is understood that it is possible to outline such actions from the moment that patterns intertwined with the dropout phenomenon are diagnosed and that they are acted upon specifically to mitigate them.

The hypothesis of the present study is that the phenomenon of dropout in the educational context can be previously diagnosed, based on the systemic collection and analysis of the conjunctural factors that precede it. Furthermore, from its detection and understanding, this phenomenon can also be mitigated through the timely action of the responsible agents.

The general objective of this study is to conduct a study on the predictive diagnosis of student dropout from the perspective of prevention against school dropout and evasion, in public schools in the final years of elementary school, based on a case study by sampling, and through the development and application of specific software functionalities in public schools in the final years of elementary school in the Federal District.

The specific objectives that will be addressed in the study are: to map and document a theoretical framework related to the research topic, considering the state of knowledge, characteristics, and trends in the relationship between school retention and the stages of Basic Education; to analyze the

occurrence or presence of didactic-pedagogical or educational initiatives for implementation or monitoring of school retention from the final years of elementary school in the public school system of the Federal District, based on the methodology established in the research; to develop and test a software prototype that will serve as a tool for the operationalization of the diagnosis; to contextualize the role of normative and theoretical-methodological references involving the idea of student retention in Basic Education and teacher training, in order to correlate the role of pedagogical practice and the school in the cognitive, sociocultural, technical-professional, and socio-emotional development of students; to analyze successful experiences based on the theoretical-practical relationship of student retention from different realities and school contexts, with the public school system of the Federal District as a case study.

METHODOLOGY

This research is proposed to be developed, initially, through the application of bibliographic, documental, and empirical methodologies, aimed at the qualitative composition of its interim, as a starting and ending point for the studies conducted and the results achieved throughout the developed research (Gil, 1999; Mattar; Ramos, 2021). Regarding the development of research on educational topics, the project aims to comply with the provisions of authors such as Alves-Mazzoti (2001), Gamboa (2007), André (2001), and Fazenda (1997). The insertion of the verification, tabulation, and analysis of the documents referred to in Ordinance No. 33/2020 will be one of the ways to strengthen and provide this research with evidence for its hypotheses, expected results, and proposed impacts in the project. The research also uses successful experiences of educational public policies for the combat and prevention of school dropout as a reference, as developed in the states of Espírito Santo (2018), Paraná (2018), and Bahia (2020).

The relationship between the theoretical-methodological and empirical-contextual is a fundamental step in proposing paths for the development of educational public policies, especially at a key moment for Brazilian education, with numerous and considerable changes and propositions of new paths for the students we find in it.

The empirical surveys required as part of the theoretical-methodological propositions and analyses of the research will be developed in collaboration with two public schools in the Federal District's school system, located in one Administrative Region. This locational alignment of the schools aims to observe, monitor, and analyze the possible connections between the elementary school stages, the theoretical and methodological epicentre of this research proposal.

After the selection of the units, the researchers will, together with the school staff, verify, tabulate, and analyze the monitoring of various data, including school attendance in the selected Educational Units, with a view to understanding their panoramas, using the means, strategies, and instruments of the public school system itself as references. It is intended that the formally instituted references be consolidated as elements to compose the database, in order to serve as part of the inputs for the prototype for the predictive measurement of dropout. The tool development stages and related procedures are described in the "Action Details" section.

PROTOTYPE DEVELOPMENT FOR THE SDPA

Here are some notes that will be used for the development of the evasion predictive software prototype. Further details will be better aligned during the development, based on scenario analysis and contributions from researchers and school communities involved.

The system should develop predictive models that can be used to forecast future cases of school dropout and identify the main reasons for these problems. Among the main operational requirements of the system, it must be capable of: collecting data from schools in the Federal District on school dropout from the final years of elementary school; storing the collected data in a database for later analysis; using machine learning and artificial intelligence techniques for data analysis; performing descriptive analysis of the collected data, including dropout rates by school, grade, gender, and other relevant variables; performing predictive analysis to identify the main factors that lead students to drop out of school; providing reports and dashboards to school managers and the government, with a hierarchical view, containing information and insights on school dropout; predicting the main access profiles, according to the level of observation of user-friendly usability patterns; allowing users to view and analyze the collected data through a friendly interface; complying with the protocols and requirements of the General Data Protection Law (LGPD) - Law No. 13.709, of August 14, 2018; providing recommendations to schools and the government on effective policies and measures to reduce dropout and increase student retention.

The technologies used will involve: the Python programming language, as it is a high-level, interpreted, and object-oriented language; the system requires the use of a database (PostgreSQL) to store the collected data securely and consistently; and the use of a web framework, with Flask for the user interface.

The use of appropriate technologies and programming languages is fundamental to ensure the effectiveness and efficiency of the data collection and analysis system on school dropout in the Federal District. Python has libraries such as Pandas, Matplotlib, and Scikit-learn to perform detailed analysis and predictive analysis of the reasons for school dropout. Regarding the tool development process from the scientific conception of the diagnostic proposal, at this moment, the main phases planned for the materialization of the idea will be synthetically pointed out. Thus, the figure below contains the macro-phases involved in the development part.

Table 1. Stages of Diagnostic Software Development

Stage	Description
Scientific Conception	Conception of the Idea in the Scientific Research Project
Requirements Analysis	Definition of needs; Definition of objectives; Definition of the development scope
Technical Specifications	Definition of needs; User stories
Process Modeling	Modeling of task flows; Technical specifications and logical software development
Production and Development	Starting the coding process; Creation of the entire logical/syntactic structure of the software; Development of the front-end/back-end for the system

Testing	Putting it into operation to analyze in a flat environment and find errors; Correcting errors based on the review; Performing return tests to start the next steps
Review	With the test results, the review process begins; If everything analyzed initially is perfect, in case of need, a new production and development begins until the tests are all correct; If everything is already perfect, the implementation process begins
Implementation	Where all the tested and perfect development will be carried out; It is the phase of implementation and publication of the system to be used by the users, who will be assisted

Source: Prepared by The Authors

The solution will be developed in accordance with Software Engineering techniques, involving: the scientific conception of the tool's functionality, aligned with educational needs and proposals for the educational context (our emphasis); requirements analysis to define the technical needs for data collection, operation, usability, storage, and other activities; technical specifications from the perspective of development needs, user stories, and the definition of the software architecture, considering criteria like scalability and robustness (for example, the MVC - Model-View-Controller architecture can be a good option); process modelling, in which the flows for the respective functionalities for software development and production will be defined; production and development based on everything that was agreed upon and defined for the system's conception; carrying out the necessary tests on its functionality and in a specific environment for this activity, with records of any abnormalities and validations that occur at this stage; a review as a process of validating everything that has already been adjusted and defined for the tool's ideal functioning, in order to start the implementation phase; implementation and publication of the tool, where, after all previous stages are observed, the process of using the tool begins at schools in the Federal District and the process of monitoring its entire operation is initiated.

Any potential errors still found during use should be corrected and added to new versions as needed. The use of monitoring tools to ensure the system is working correctly and to quickly identify potential problems is desirable at this stage.

The operationalization of the empirical stage of the predictive dropout diagnosis cycle, with the use of the outlined prototype, will occur in the schools according to the following cycles:

- Definition of diagnostic dimensions and their respective indicators - initially, the analysis is intended to focus on the following contextual dimensions: i) the student's home context; ii) student engagement; iii) family engagement; iv) health and socio-emotional aspects; and v) other secondary information.
- Data collection for each indicator, through the application of the collection instrument.
- Definition of risk groups and their respective criteria, by studying risk groups based on scale-format criteria that will serve as parameters.
- Qualitative analysis of the collected data and their organization - a study of risk groups based on scale-format criteria and dashboard modelling.
- Monitoring and follow-up - follow-up/monitoring from the panels/dashboards and reports, and the implementation of intervention actions.
- Evaluation and realignment, as a way to make adjustments for the next cycle.

The data, information, and analyses resulting from this study will be subject to further exploration, analysis, and dissemination of results by the researchers involved in the research proposal, in order to contribute to reflections and the planning of future actions related to the topic.

DISCUSSION

The national context related to dropout in Basic Education is worrying and challenging. The students who get lost along the educational path reflect the failure of the entire system, of every professional who works in it, and of the country as a whole.

It is in no way, and cannot be considered, acceptable that students are lost from schools year after year and may never have the opportunity to return. However, this is exactly what has been happening in Brazil. This can be confirmed by analyzing national data from the School Census, as illustrated in the following graph.

Failure Rate (failure + dropout) in Basic Education

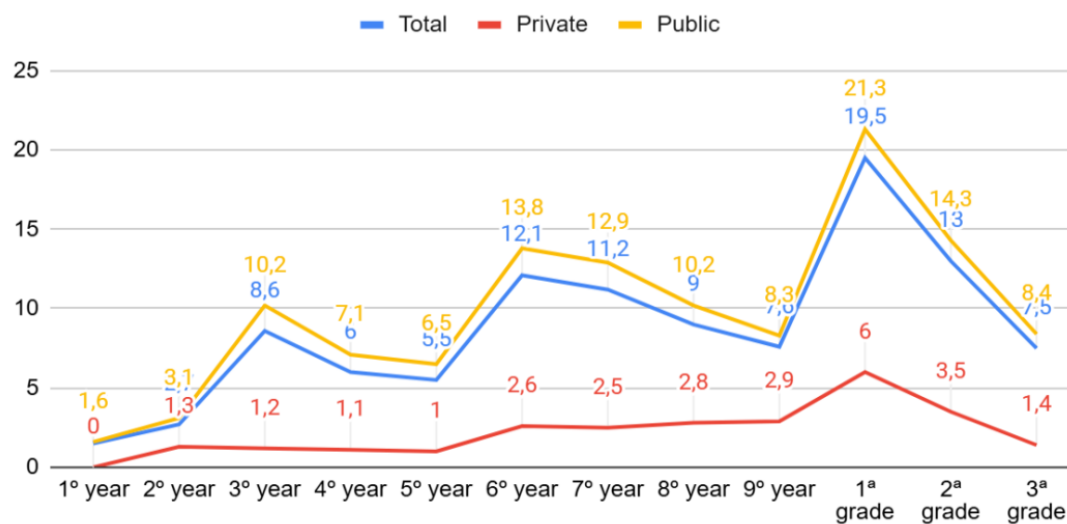


Figure 1. Failure Rate (retention + dropout) in Basic Education

Source: <https://www.gov.br/inep/pt-br/areas-de-atuacao/pesquisas-estatisticas-e-indicadores/censo-escolar/resultados>

Data show that, in the most prominent case, that is, in the 1st year of high school, especially in public school systems, failure rates reach up to 21.3%. This points to the pressing need for intervention, especially in the stage that precedes such occurrences, namely, in the final years of elementary school. What leads students to drop out and fail in school? How can the school act to mitigate school dropout?

Acting to combat dropout requires that school systems be equipped with data and information and be able to act proactively. To this end, the use of technological resources provides highly valuable input. According to Buckingham (2010, p. 55).

[...] in an environment that is increasingly dominated by the proliferation of electronic media and the demands and imperatives of consumer culture, the school urgently needs to take on a more proactive role. Technology may be able to contribute, although it does not do so

spontaneously. In short, we need to stop thinking about these issues in simple technological terms and start having new ideas about learning, communication, and culture.

In convergence with the author's ideas, it is understood that technologies can play a fundamental role in promoting equity in the educational environment if their use is directed toward meeting the needs of the systems and, more precisely, of each student in a specific and individualized way. With regard to combating dropout, it is understood that digital technologies already have the tools to act in the survey of the indicators that cause it, and mechanisms can be outlined to allow for its predictive survey, that is, even before it occurs.

In this sense, the diagnosis of student retention in the final years of elementary school, made possible by a predictive tool, is the focus of the present study. This thematic cutout is structured based on the conviction of the need for a diagnosis of student dropout, whose data enables greater autonomy for school management. In this way, variables, factors, conditions, and perspectives are outlined to constitute a software prototype capable of producing consolidated information to understand and enable management autonomy in discussing solutions aimed at keeping students in school, ensuring their right to education, and, in a broader sense, the continuity of their studies in the stages of Basic Education.

The locus for the development of the research will be the public school system of the Federal District, considering the distribution of schools located in one of its fourteen regional education coordinations. The sample for surveys and tests related to the study is composed of two schools offering the final years of Elementary School, and the number of schools may be expanded if necessary for the refinement of the study. The theoretical basis will be composed of a literature review concerning the topic of retention, evasion, and dropout, technology used to accompany the collection of empirical data through technical visits, and consultation with documents and references from federal and district public bodies, with a view to strengthening the theoretical, methodological, and analytical bases of the proposed research.

The main results to be achieved include the development of a prototype, as a technological tool equipped with Artificial Intelligence, capable of outlining a preventive diagnosis for student dropout in the public school system of the Federal District in relation to the final years of Elementary School.

Through the computerized tool, it will be possible for schools to systematically monitor risk indicators of student dropout and evasion, as well as to act to mitigate them.

Thus, the perpetuation of dropout and school failure rates in Brazilian Basic Education over the years denotes a difficult reality to overcome, for which efforts need to be directed, especially starting from local realities, where the intricacies of practical contexts are best known.

Especially in recent years, the topic of school retention has gained even more relevance in the educational sphere due to the effects of the Covid-19 pandemic, which, for at least two years, have had and continue to have direct impacts on school systems in Brazil and around the world. As formulated by UNESCO, it is necessary to develop new strategies to mitigate these impacts, imagine new horizons, and face the challenges ahead for the generations that will carry the didactic-pedagogical losses in the coming years, along with political, economic, and social issues (UNESCO, 2022).

In response to the losses of this pandemic period, Brazil saw the promulgation of Decree No. 11,079/2022, which establishes the National Policy for the Recovery of Learning in Basic Education. In different municipal, state, and federal, public, and private systems, there have also been efforts to identify and mitigate the impacts of the pandemic on students, addressing the topic of retention in the schooling process, seeking to address gaps and deficiencies in their learning in recent years.

In the Federal District, even dating from a period before the one mentioned above, there is a tradition of prominence in the experience, expertise, and maturation of the identity of the Curriculum in Motion, through its guidelines and fundamentals, which guide learning and the right to Education in all stages and modalities of the DF's public school system. The Curriculum in Motion for Elementary School, in its didactic-pedagogical guidelines, considers, for example: "1. to enable learning, based on the democratization of knowledge, from a perspective of inclusion considering the Transversal Axes: Education for Diversity, Citizenship and Education for Human Rights, Education for Sustainability" (Brasil, 2018b, p. 9); and "5. to understand the student as the central subject of the teaching process, capable of ethical, critical, and reflective attitudes, committed to their learning, from the perspective of student protagonism" (Brasil, 2018, p. 9).

As recent experiences of efforts to combat and prevent dropout and evasion, there is also the School Visitor Project in the DF, from the Secretariat of Youth, which aims to "serve students aged 15 to 29 who accumulate six consecutive or ten intermittent school absences in a month" (Federal District, 2022, p. s.n). In the Federal District, there are, moreover, other normative instruments that clarify the role of teachers, educational counsellors, and regional education coordinations, present in Ordinance No. 33 of February 12, 2020, which establishes the procedures for Monitoring School Attendance in the Public School System of the Federal District, in accordance with the system's School Regulations, updated by Ordinance No. 180, of May 30, 2019, which amends Ordinance No. 15 / SEEDF, of February 11, 2015, published in the DODF No. 41, of February 27, 2015, which approves the Regulations of the Public School System of the Federal District.

CONCLUSIONS

This study is proposed to, through its contributions, integrate with ongoing actions, substantiating them with more precise data and indicators for the implementation of public policies and also for the proposal of new policies at the district level and actions within the school itself, through the actions of the school community.

When proposing a study on Basic Education in its organization in Elementary School, we must start from its current structure established by Law No. 11.274, of February 6, 2006, which amends the wording of arts. 29, 30, 32, and 87 of Law No. 9.394, of December 20, 1996, which establishes the guidelines and bases of national education. The age group in the last year of Elementary School can therefore vary from 13 to 15 full years, when, eventually, students can be referred to Youth and Adult Education, for example.

Regarding the Child and Adolescent Statute, this definition is set out in its Article 2, which states: "For the purposes of this Law, a child is a person up to twelve years of age, and an adolescent is one between twelve and eighteen years of age" (BRASIL, 1990, p. s/n).

In relation to the topic of school evasion and dropout, there are different contributions, ranging from the theoretical and methodological framework for the analysis of cultural, social, economic, and political factors and variables of this phenomenon to historical series of data collection and analysis, on scales that vary from the municipal to the federal level. At the federal level, there are the strategies of PNE Goal 2 and some of its strategies related to the proposal:

PNE Goal 2: Universalize the 9 (nine) years of elementary education for the entire population aged 6 to 14 and ensure that at least 95% of students complete this stage at the recommended age, until the last year of this PNE. (BRASIL, 2014, p. s.n). [...] 2.3) create mechanisms for the individualized monitoring of elementary school students; 2.4) strengthen the follow-up and monitoring of the access, retention, and school performance of beneficiaries of income transfer programs, as well as situations of discrimination, prejudice, and violence at school, aiming to establish adequate conditions for the school success of students, in collaboration with families and public bodies of social assistance, health, and protection of children, adolescents, and youth; 2.5) promote the active search for children and adolescents out of school, in partnership with public bodies of social assistance, health, and protection of children, adolescents, and youth (Brasil, 2014, p. s.n).

In line with the provisions of PNE Goal 2, the preventive diagnosis on school retention will consider that studies in education have specific challenges concerning the topic of school retention. In this way, there are contributions made by Alves-Mazzoti (2001), Fofonca (2018), Gamboa (2012), and Pimentel et. al (2001) regarding the complexity and specificities of educational studies.

Regarding the proposed research, theorists such as Silva Filho and Lima Araújo (2017) and Borja and Martins (2022) are some examples of studies on the topic involving school evasion and dropout. In addition to these authors, there is a considerable body of exploratory studies, reviews, specific cases, field studies, analyzing regulations or historical series of government data that can be considered for the consolidation of the theoretical foundations and justifications of this study.

It is also important to note that it is necessary to think about dropout, retention, and evasion through the lens of a re-signification of the life projects of Basic Education students. In this sense, there are direct connections between the multiple youths, their complexities, and challenges for educational public policies that cover this age group, as highlighted by Araújo et al (2020), Damon et al (2003), Dayrell (2003), and Dellazzana-Zanon and Freitas (2015).

In addition to actions aimed at reducing and combating dropout and evasion, it is necessary to think about the continuity of children and young people in their schooling path. The dimensions of their life projects, including professional aspirations, socio-emotional aspects, and the relationship between the personal and the social, are essential to be able to, for example, guarantee the right to education through the continuity of the young person who finishes their studies in the 9th grade and enters the 1st year of high school.

With the development of the study, the following expected results are also expected to be achieved: promotion of the debate on factors that contribute to dropout in Brazilian Basic Education, in general, and in the public school system of the Federal District, in particular; theoretical-methodological and empirical-contextual deepening on evasion and retention in the final years of Elementary School in the Federal District; articulation between higher education and basic education, through concepts, categories, references, norms, and studies developed by the researchers involved in the research;

analysis and presentation of the results achieved between the theoretical and normative framework and the material collected from the technical visits, bibliographic and documentary phases of the research, and, mainly, from the computerized system prototype to be developed.

It is expected that the development of this research will strengthen actions related to student retention in the second stage of Elementary School, based on the monitoring and deepening of studies, analysis, and a critical-propositive vision for Basic Education. Through studies on the topic, it will be possible to immerse oneself in the main causes of school dropout and evasion, as well as to obtain input for their mitigation.

The implementation of a prototype to identify, in advance, students with a higher risk of dropping out of school and, consequently, possible evasion, will be based on the combination of personalized student information (socioeconomic level, income situation, school engagement, among others) with information from the school itself (absenteeism, grades, school trajectory).

Based on the prototype's data, through artificial intelligence, the tool will identify risk factors related to school dropout and evasion, in order to provide concreteness, as a deliverable to the public school system of the Federal District, to the preventive diagnosis study for student retention, the main objective of this research. With this information, school managers will have input for the decision-making process within their scope of action, and for what is beyond it, the school will have input to propose partnerships with other institutions.

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Ubuntu* in Education: AI for Open Learning and Indigenous Knowledge Integration

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ABSTRACT

Inspired by the Māori concept of “ako”, which emphasises the idea of reciprocity in teaching and learning, this paper explores the role of Artificial Intelligence (AI) in fostering a more inclusive education system in South Africa. This study looks particularly at integrating indigenous knowledge in the process. AI has the potential to facilitate more open education and remove the intergenerational persistence in access to education through the sharing of resources, more personalised learning experiences (with real-time feedback), helping learners to articulate themselves in a second language and providing ideas for a contextually appropriate curriculum, that blends global academic standards with indigenous knowledge. These systems can make educational content more accessible across languages, particularly where indigenous languages have lacked educational resources. South Africa’s diverse indigenous cultures and languages present both challenges and opportunities for the education system. Historically, indigenous knowledge has been marginalised, yet the rise of AI offers an opportunity to create more inclusive learning environments that respect and integrate these knowledge systems. This paper highlights some of the barriers to learning for marginalised communities in South Africa (particularly in rural areas) and how AI (particularly Generative AI) can be used to remove some of these barriers. However, significant challenges remain in the adoption of AI technologies, including access to electricity, Internet connectivity, digital literacy, affordability and quality of machine translation. These barriers hinder the ability of many communities, particularly in rural or underserved areas, to fully benefit from AI-enhanced education. To address these challenges, this paper proposes a systematic literature review of AI applications in education from both developed and developing countries, and examines how their experiences can inform countries with diverse indigenous cultures and languages, like New Zealand and South Africa. The involvement of indigenous communities in the development of AI tools will ensure that their knowledge systems are represented appropriately and authentically in the learning process.

*(*Ubuntu is a Southern African philosophy that emphasises interconnectedness, mutual respect, and shared humanity, aligning well with the concept of reciprocity in education).*

Keywords

ubuntu philosophy; generative artificial intelligence; indigenous knowledge systems; multilingual education; cultural heritage; inclusive learning; African higher education; ethical artificial intelligence; decolonised pedagogy; knowledge preservation

This paper is published in full elsewhere.

Evaluating quality online course design: The impact of creating, implementing and using the TELAS framework

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ABSTRACT

The Technology Enhanced Learning Accreditation Standards (TELAS) was developed through several phases of consultation and refinement over five years. The current version of the TELAS framework has been operationalised through the training of assessors and its availability on the TELAS website. The TELAS framework allows for quality assurance of online course design for individuals and universities. It provides a structured framework to evaluate the effectiveness of the online learning components, such as course content housed within a learning management system. Since its implementation, the TELAS portfolio has trained over 240 people in the use of the framework with 40 of these participants completing additional assessment to become certified TELAS peer reviewers. This framework continues to be used in a variety of ways across institutions both formally and informally. Initiatives have included institutional-level TELAS assessments, the evaluation of entire programs offerings and the formal assessment of individual courses. As the framework is open access, TELAS has been adopted and adapted across a number of higher education providers in a variety of contexts. This paper presents the results of an evaluation of the impact of the TELAS framework, highlighting its influence across the sector and the many ways in which it has been implemented to enhance online learning quality. Key findings include examples of implementation in various ways and examples of impact including from an institutional perspective. Normal text, left-right justified. Before Opt, after 6pt.

Keywords

quality online learning; accreditation standards; evaluation; TELAS; higher education; online course design; quality assurance; professional development; reflective practice; learning design

This paper is published in full elsewhere.

Learner Support and AI: From Assumptions to Realities: A Systematic Review

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ABSTRACT

Learner support is a cornerstone of open, distance, and digital education (ODDE), yet providing effective, scalable, and equitable support remains a persistent challenge. With the rise of artificial intelligence (AI) and increasing publications on it, it is important to see how higher education institutions are adopting AI-enabled tools to support their learners. This study systematically reviewed and synthesized 61 publications (2010–2025) to examine how AI has been applied to learner support, what practices and constraints are reported, and whether current approaches meet diverse learner needs. Using the Institutional Support for Student Persistence Model (ISSPM) and an AI typology, the review finds that adaptive systems and personalization—particularly chatbots and recommender systems—are the most common applications, followed by profiling and prediction. Reported benefits include timely interventions, personalized guidance, and workload reduction for staff; however, technical limitations, privacy concerns, limited inclusivity, and reduced human interaction pose significant challenges. The review finds critical blind spots, especially in addressing diverse learner needs and in the underexplored transition phase of the student journey. Notably, diversity in population, such as marginalized groups or neurodivergent learners were absent. By offering a structured synthesis from an institutional perspective, this review contributes to the established learner support research about the role of AI in shaping equitable and sustainable learner support in higher education.

Keywords

Learner support, student support, student services, artificial intelligence, AI, AIED, open education, distance education, digital education, online education

This paper is published in full in *Open Praxis*.

STEM Teacher Training and Digital Empowerment in the South Pacific: A Dual Perspective

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ABSTRACT

The Pacific region is exposed to many forms of disasters. Incidences including the COVID-19, natural disasters such as volcanic eruptions, cyclones, hurricanes, flooding, tsunamis, landslides, and earthquakes have created chaos in the region. In most cases, assistance and support after such disasters take a while to reach many countries. The isolation from the rest of the world, and the remoteness of many areas from urban centres mean that people must cope with whatever is left after such crises. The education sector, like other sectors affected by these unforeseen circumstances find the learners, teachers, institutions, and ministries of education struggling to continue learning and teaching without the resources and infrastructure that has been damaged. In 2020, the Commonwealth of Learning (COL) in partnership with MFAT initiated a 5-year project (2020-2025) to promote ODFL learning, methods, and technologies and to better equip the Pacific Island countries in times of such natural disasters. Together with COL's regional centre, PACFOLD, the project trained teachers of the South Pacific Commonwealth countries on the identification and use of OERs in teaching Science subjects, use of AI in teaching material generation and on the creation of a Community of Practice among the teachers.

Concurrently, learners of today expect learning to be innovative with the use of digital tools that enrich their learning experiences. The teaching and learning landscape have therefore been greatly transformed in recent years and teachers in secondary schools in Fiji require training and support to become efficient technology users in their classrooms. This paper presents a dual perspective examining both the regional STEM teacher training initiative and Fiji's digital empowerment program, exploring their synergies and collective impact on Pacific education systems.

Keywords

STEM education, digital tools, teacher training, OER, Pacific Islands, professional development, technology integration

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INTRODUCTION

The era of digital transformation in the education sector demands learning about digital skills and being prepared to face the challenges of the modern information society. The role of digital technologies has penetrated all aspects of life including education. The demand to upskill teachers is necessary so that teachers are better equipped to teach the natives of technology. There has been a lot of emphasis on integration of advanced technology in teaching and learning so that the quality of education can be further improved in Pacific. One of the Thematic Area of the 2023 Denarau Declaration Fiji National Education Policy Framework 2024-2033 emphasises policy objective that addresses promoting digital literacy among students and teachers (Ministry of Education, 2023). This is only achievable if teachers are trained and empowered to become efficient technology users in their classrooms.

The Pacific region's unique vulnerability to disasters creates additional urgency for these upskilling efforts. The Commonwealth of Learning's initiative represents a regional response, while Fiji's national program addresses localised needs. Both approaches recognize that research shows digital tools enhance students learning experience and improves student engagement. This years' world Digital Learning Day also focused on how learners use digital tools to enhance education and inspire creativity. The celebrations acknowledge and marks the important role digital technologies play in education and teachers must make use of the digital tools to make learning innovative for tech native users.

BACKGROUND

COL's STEM Teacher Training Initiative

To facilitate the workshop requested by Ministry of Education Fiji, a three-day workshop was organized at the University of the South Pacific, Laucala campus for Eastern teachers. The Eastern teachers were specifically chosen because of their availability during holidays as majority came to the main island to spend holidays. These are also the set who usually miss out most trainings due to their locality, so this workshop provided the remote teachers the opportunity as part of their professional development. The workshop was focused on empowering teachers with ICT competencies and use of Technology for everyday classroom practice. The training was facilitated by Centre for Flexible Learning at the University of the South Pacific.

The workshop was divided into sub courses. The first day covered 3 sub courses namely Moodle for Educators, Introduction to Cybersecurity for Teachers and Web Literacy. The second day again focused on Open Education resources, Technology Integration Frameworks and Integrating OERS in eNotes. The final day concluded with sub course Moodle Tools for Assessment. A total of 45 participants participated in the training from various subject area.

Fiji's Digital Empowerment Program

The Commonwealth of Learning's Evaluation Report (2025) highlights Workstream 3.3, which was specifically rescoped to support eLearning for STEM teachers. This workstream trained 927 teachers across Fiji, Samoa, Solomon Islands, and Tonga, with an investment of NZD \$451,000 (approximately \$249 per trainee). The initiative included the use of AI-powered OER generators from 2024 onwards, further strengthening the capacity of teachers to create and adapt STEM resources.

FINDINGS AND DISCUSSION

Participant Demographics

Table 1. Subject Background of Participants

Subject	No. of Participants
English/ Vosa Vaka Viti/ Hindi/ Other	7
Mathematics	7
Science	10
Arts	2
Tech Science	1
Computer Science	4
Agriculture Science	2
Food Science	1
Commerce	6

Table 1 presents distribution of teachers from different subject areas accounting for majority from the science discipline. It was also interesting to note language and other subject teachers turning up for the workshop and the teachers expressed their interest in attending similar trainings in future. The diversity of the subject background and the teaching experiences of participants provided a comprehensive assessment on the challenges and opportunities of integrating digital tools in various disciplines at school level. The subjects taught by the participants ranged from core academic disciplines such as Mathematics and English to practical subjects like Agriculture and Food Science. For each subject it was noted that the level of application and challenges of using digital tools varied. It was also revealed from the data that Computer science teachers (n=4) were more tech savvy compared to other participants. This is due to their familiarity with digital tools as part of their curriculum compared to other teachers who may have faced difficulties familiarizing themselves with digital tools and completing the assessments due to resource limitations and their curriculum structure. The subject diversity suggests that future trainings programs for teachers need to be subject-specific. Each subject has different digital tool needs so trainings in future must include subject specific strategies for integration of digital tools. As per Table 1, the subject background may influence the teachers' attitudes, readiness and challenges in adopting digital tools. The subjects with highest number of participants are more likely to have higher rates of digital tool adoption compared to the underrepresented subject teachers who may be in need for more resources and support.

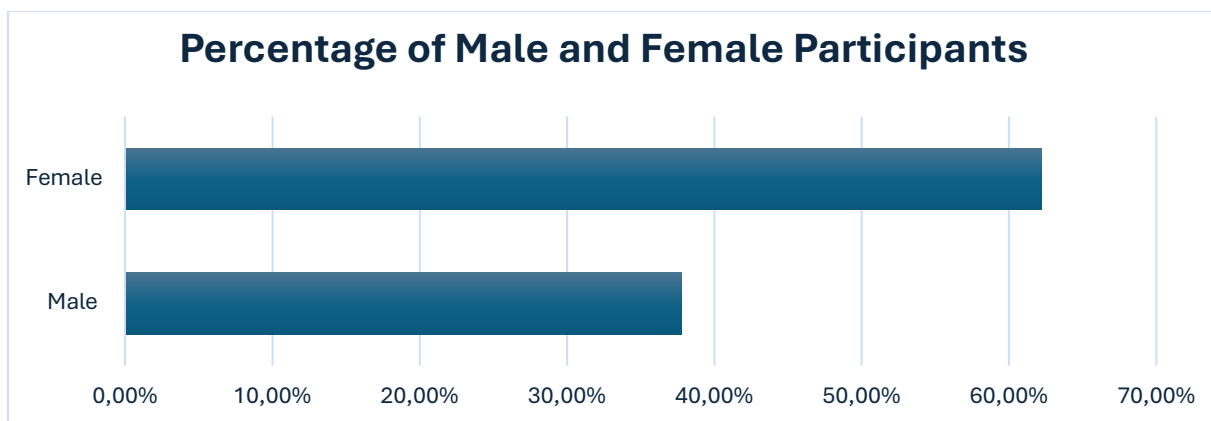


Figure 1. Gender distribution of participants

The gender distribution in this figure show that majority of participants were females (62%). Research by Gomez-Trigueros and Yanez de Aldecoa (2021) shows that females encounter added challenges with technology adoption so they may need more support and resources in their teaching compared to their counterpart. There is digital gender gap created in the teacher education and this research concludes that gender gap in digital competencies among teachers affect their ability to integrate technology effectively in the classroom.

Training Effectiveness

Workshops		
Moodle for Educators	497 views by 55 users	Saturday, 1 March 2025, 5:51 PM (1 day 19 hours)
Introduction to Cybersecurity for Teachers	131 views by 49 users	Saturday, 1 March 2025, 5:59 PM (1 day 19 hours)
Web Literacy	203 views by 51 users	Saturday, 1 March 2025, 5:59 PM (1 day 19 hours)
Open Educational Resources	218 views by 47 users	Saturday, 1 March 2025, 6:11 PM (1 day 18 hours)
Technology Integration Frameworks	199 views by 48 users	Saturday, 1 March 2025, 5:59 PM (1 day 19 hours)
Integrating OERs in eNotes	280 views by 48 users	Saturday, 1 March 2025, 5:59 PM (1 day 19 hours)
Moodle Tools for Assessment	426 views by 49 users	Saturday, 1 March 2025, 5:59 PM (1 day 19 hours)

Figure 2.0 User engagement per courses

Figure 2.0 shows analysis of number of times the courses were viewed by participants and user engagement in each course. This data reveals varying levels of interest shown by participants across the workshops. Moodle for Educators recorded the highest number of views by participants rendering strong popularity and interest amongst the participants.

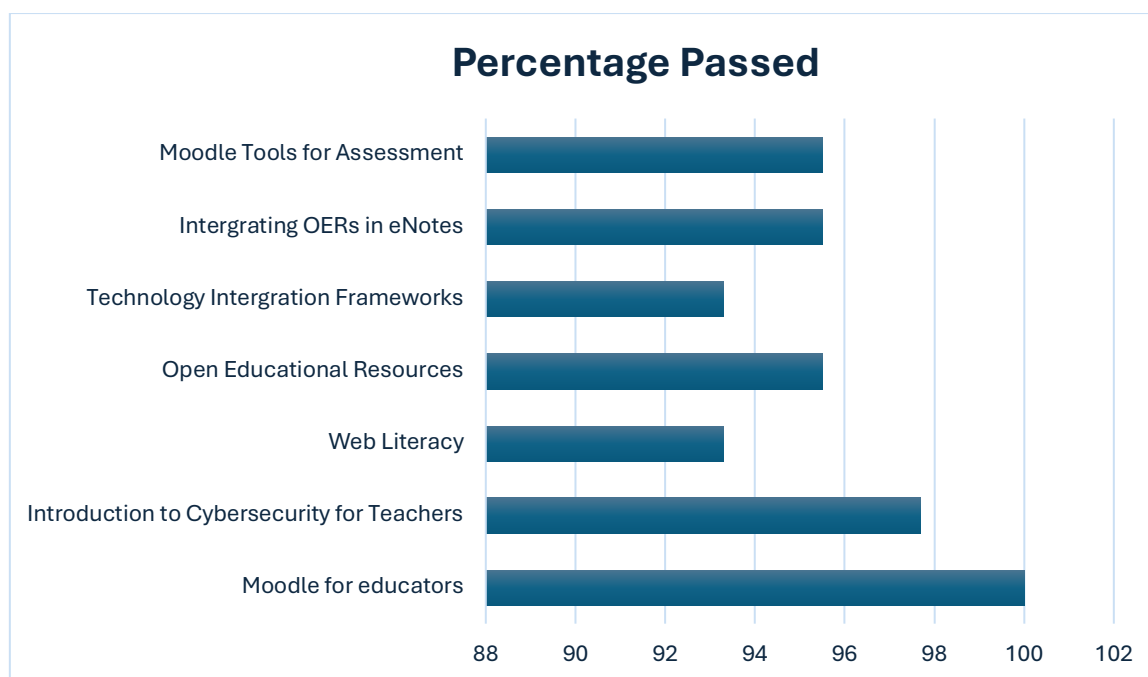


Figure 3. Course completion by each participant

The graph above represents the completion rates of participants in various courses that were offered in the training. Completion rates are generally high with most courses exceeding 90% suggesting very strong engagement from teachers and strong course effectiveness. Moodle for Educators records the highest percentage pass indicating strong interest in the very first course offered on day 1.

Responses	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree	Total
The workshop provided you with competencies (knowledge and skills) you expected.	25 (81%)	6 (19%)	0	0	0	31
The workshops were relevant to my current or future roles	26 (84%)	5 (16%)	0	0	0	31
The facilitators provided clear instructions.	20 (65%)	8 (26%)	3 (10%)	0	0	31
The facilitators interacted well with the participants.	26 (84%)	5 (16%)	0	0	0	31
The learning materials provided were appropriate and relevant.	23 (74%)	7 (23%)	1 (3%)	0	0	31
I was satisfied with the overall structure and delivery of the workshop	16 (52%)	11 (35%)	4 (13%)	0	0	31

Figure 4. Participants perception of the delivery of the workshops

According to the responses collected from 31 participants, there is high indication that the workshops were successfully completed and all courses met the participants expectation. There is no negative response indicating high level of satisfaction from participants. 13% were neutral with overall structure and delivery indicating room for improvement in this area.

Table 2. Valuable and Insightful Content of the Workshop

Category	No. of responses
Moodle Tools and Assessments	8
Integrating OER in eNotes	12
Cybersecurity and Digital literacy	4
General positive Feedback	6

According to the responses provided by the participants, it is noted that the workshop was successful in delivering relevant content, practical aspects and contained impactful content for the participants. The most valuable course amongst the participants was integrating OERs in eNotes. This may be because teachers use notes and lesson plans daily in their lessons. The facilitators were also praised for their effort in preparation and delivery of the workshop.

Table 3. Major Challenges Faced by Participants

Category	No. of responses
Time Constraints	18
Pace of delivery was fast	7
Technical Issues	1
Overlap in Modules	3
No challenges	5

58.1% of the respondents mentioned Time constraints as a major challenge as the participants had to complete several tasks within a short period of time. Many suggested for a weeklong session as the contents of the workshop needed more time for understanding and completion of tasks.

Table 4. The plan to incorporate the skills and knowledge learnt

Category	No. of responses
Integration of Technology	12
Lesson Planning and Revision	10
Professional Development	6
Student Engagement	5
General	8

The participants have shown a strong desire to put into practice what they acquired in the training. There were four participants who outlined barriers such as lack of resources and infrastructure back in their school which will hinder their practice to use the skills learnt.

Integration With COL Workstream 3.3 Findings

The UNESCO Office Bangkok & Regional Bureau for Education in Asia and the Pacific (2022) state that many teachers were not sufficiently trained to teach online with unfamiliar tools. Similarly, Iwakuni (2021) articulates that teachers in Pacific had limited knowledge of remote lesson delivery and were not prepared to deliver remotely. In such context empowering teachers in form of professional development can be a useful approach to upskill teachers (Popova et al., 2021). The roles of teachers are changing as they are expected to teach the natives of technology with sophisticated technology. Teachers are seen as lifelong learners who must engage in sustained professional development to master complex skills and knowledge.

CONCLUSION

Digital education has emerged as a prevailing mode of pedagogical delivery, offering educators both opportunities and challenges. The unique needs of each subject area must be considered when organising trainings on digital tools. There is a very strong desire from participants to learn about the latest technology which they can use in their classes upon return to their schools however, few may not be able to use the skills and knowledge because of lack of resources and infrastructure. However, there is nothing stopping one from receiving training and preparing for future.

The Commonwealth of Learning's regional initiative and Fiji's national program demonstrate complementary approaches to addressing the Pacific's educational challenges. While COL's work provides a framework for disaster-resilient STEM education across multiple nations, Fiji's focused teacher training on digital tools shows how these principles can be adapted to local contexts. Both models highlight the critical importance of:

1. Practical, hands-on training components
2. Ongoing support and community building
3. Addressing gender disparities in technology adoption
4. Advocating for better infrastructure in remote schools

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Learners' reflection on the use of ePortfolio in Social Work at the University of the South Pacific

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ABSTRACT

Using ePortfolio for Social Work SW300 Fieldwork Practice was to provide a virtual environment whereby learners could provide documentation of their final placement in the Bachelor of Arts (Social Work) at The University of the South Pacific (USP). The ePortfolio was designed by a team to provide accessibility for learners from multiple campuses across 12 Pacific Island nations. This phenomenological study provides a lens into 10 learners' experiences and reflections on their use of the ePortfolio, the cultural and institutional context in this practicum, learners' identification and perception of key learning, reflection on their capacity building; and their evaluation of tools and use of technology. Mahara was the platform via Moodle for learners to work within their 3 month or 185 hours practicum. The STARL-P Framework (Situation, Task Action Reflect Learning -Planning) provided guided questions by the teacher within the ePortfolio which was thematically analysed through a qualitative software NVivo.

With national disasters such as cyclones and floods and possible pandemic lockdowns impacting small island nations, introducing the use of ePortfolio, and providing reflections of learners within the ePortfolio will provide insights for future development and sustainability of Social Work education in the South Pacific

Keywords

eportfolio; reflection; starl-p; social work; higher education; Pacific; technology

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INTRODUCTION

The ePortfolio for Social Work *SW300 Fieldwork Practice* was to provide a virtual environment for final year students at The University of the South Pacific (USP). This university is governed by 12 countries in the South Pacific region, and the population of the region is approximately 1.3 million. The campuses are scattered across the South Pacific Ocean. The Fieldwork Placement ePortfolio was designed by the Course Writer and Instructional Designers to provide access for learners to document their learning across the Pacific Ocean.

The design embeds the use of STARL-P framework which consisted of the elements of *Situation, Task, Action, and Result*, and *Learning and Planning*. This study consists of 10 final year Social Work students, and they were from Kiribati, Solomon Islands, Vanuatu and Fiji Islands.

Prior to the introduction of the ePortfolio, the documentation of Fieldwork Practice was submitted by learners in a binder of printed resources at the end of their three months or 185 hours of fieldwork experience. Introducing the ePortfolio enabled learners to include their knowledge of the situation that occurred on placement, the services offered, their roles during the encounter, and the learning that took place. Adding the artifacts during various parts of the placement was a progressive journey. These all contributed to the reflections they underwent throughout the duration of their placement. This paper examines the use of technology via ePortfolio where students provided artefacts of their learning experiences.

LITERATURE

Technology has become an integral part of social work practice, transforming traditional methods of client engagement, case management, and service delivery. A systematic review by Afrouz and Lucas (2023) explores this growing trend in Higher Education, identifying the key benefits, uncertainties, and future directions of technology-mediated social work practice. Apart from software, learning management systems and digital spaces, a team of Instructional Designers were working with the Course Coordinator to create a platform where students reflected on their learning journey. Dawson & Gupta (n.d) indicated the importance of the involvement of Instructional Designers on the online course development team and their contribution to improving student outcomes, retention and meeting the competencies of accreditation requirements. The Social Work programme is accredited to Community Work Australia. Lee & Chun (2024) states that the fourth industrial revolution will further impact Social Work, such as Artificial Intelligence. With the COVID-19 Pandemic, social workers found themselves working harder (Nicholas, Samson, McFarlane (2023), remotely, and the requirement of continuous adapting processes by using technology (Afrouz & Lucas, 2023). With increasing budgetary constraints in the field of Social Work, Social Work Education had to resort to the use of technology to achieve competencies and demonstrate evidence of their learning (Drolet, 2023). Using the ePortfolio platform through Mahara was seen as a possible solution.

The ePortfolio

The design of the ePortfolio provided opportunities for students to present learning experiences in context, using examples of their own work as evidence of skills and competencies. Kahn (2019) stated that "this included reflections, framing narrative, and including multimodal artifacts. EPortfolio can be used for placement or practicum, assessment and serve as a High Impact Practice (HIP)." Eportfolio can be for assessment or be reflective or a combination (Fitch. Et.al, 2008).

However, the value of the ePortfolio experience for students is dependent on how it is implemented; that is, “the pedagogy and practices of faculty and staff as well as broader support structures” (Eynon & Gambino, 2017, p. 171). When there is academic coursework and placement, it brings out real world application and hands on experiences, complimented by academic understanding (Eaton, 2025; McGuire & Lay, 2020). E-Portfolio supports assessment and building students' capacities. When ePortfolio is well designed, they may include “integrative learning, self-awareness, reflective practice, metacognition, and more” Kahn (2019). Eynon & Gambino (2017) found that many students using ePortfolio were able to be successful in their studies in Higher Education. The ePortfolio also embedded the Bachelor of Arts Social Work programme competencies—professionalism, ethical practice, diversity and difference, advocacy, policy and research at USP (Ramacake, et al., 2024, p. 59).

Drolet et.al (2023) and Agbawodikeizu et.al (2025) discusses that participants shared the importance of the meaningful inclusion of Indigenous social work into all aspects of field education in Canada and Nigeria. As USP is a regional institution with many groups of indigenous people, cross cultural competencies is one of the graduate attributes in their programmes. This includes collaboration and group work where students are co-constructivists (Engelhardt, 2024). Hossain et al. (2024) note that a lack of indigenous social work knowledge affecting Bangladesh. The ePortfolio provides the space for the expression of indigenous values, funds of knowledge and practices.

Indigenous Social Work can be included via student reflection on identity, cultural competencies and cross-cultural competencies. Gustafsson (2023) indicated that situations can be marked by language diversity. Tuisawau (2020) further recommended that indigenous languages initiatives be added to be used in ePortfolio at USP. Presently, all ePortfolio at USP are presented in English.

As a qualitative study, making meaning includes reflection-in-action for the student “As he tries to make sense of it, he also reflects on the understandings which have been implicit in his action, understandings which he surfaces, criticizes, restructures, and embodies in further action”. (Schon, 1983, p.50). This reflection-in-action within the Social Work placement provides the student the opportunity to glean from his/her Social Work programme, the persons' cultural knowledge and adapt to a new environment. According to Björktomta & Tham (2024), the students' reflective writing contributes to building a professional identity and the multi-faceted placement in the ePortfolio can illustrate the development of the student's professional identity.

METHOD

To create the ePortfolio, Mahara was utilised in conjunction with Moodle. Each of the 10 students have provided informed consent for their ePortfolios to be used by the Coordinator after completion of their placement and grading. This phenomenological study utilized the STARL-P framework which provided the pertinent questions for students to reflect on in each aspect of their placement. STARL-P consist of *Situation, Task Action Reflect Learning-Planning* framework and provided the learners the focus to identify the task, examine the action and the result, as well as reflect on what they learnt. STARL-P provided the opportunity for students to use reflection in action (Schons, 1983). Through the 185 hours required of their practicum, students had many opportunities to add voice and to provide their insight of their experiences. The artifacts which included reflections and responses were clustered as themes via NVivo software. The coding was a cyclical act, where patterns were identified as themes.

FINDINGS AND DISCUSSIONS

This was based on the students' reflections from within the various modules within the SW300 ePortfolio.

Cultural Experience.

One of the Graduate Attributes in the University of the South Pacific strategic plan was to have "cross cultural competencies" (USP, Strategic Plan 2022, p. 13). The SW300 curriculum provided opportunities for students to look at different South Pacific case studies, to reflect and to acquire cultural sensitivity. As this is a regional university, students were also able to acquire cross cultural skills. Students' responses illustrated their reactions to these learning opportunities.

This week's case, our clients is the Khans family. I noted that we have moved from a Samoan family to an Indo- Fijian family. Luckily for us, as we move from one cultural background to another, we get to explore how we as a social worker should approach a family's home with regards to their cultural background. In the Khan's case, we were given a video to watch that shows us how social worker should approach an Indo-Fijian's family home and also the do's and don'ts while on the visit. (Student 2)

Learning about Fa'afafine because I always thought of Fa'afafine as transgenderism but it is much more than that in Samoan society. (Student 3)

Things to consider in general is the fa'a Samoa concept when working with a client especially from a Samoa community. It drastically influence the work of a social worker especially if it want to be effective and approachable in it work. Things to ponder is reflected within the fa'aSamoa or Samoa way which are the Samoan Heart, Samoan way, Structure and institution, Ceremonies, protocol and values. (Student 1)

Key Learning

Students' learning was multifaceted, where they learnt to use a framework, utilize new assessment tools, summarize cases, and learnt about components of research such as critical analysis. They also learnt to communicate with clients, time management and professionalism.

The ability to identify my framework through a combination of knowledge, skills, values and purposes from a week reading. This has taught me that in placement our world of practice of framework has inform our actions and decision and it is critical to reflect on your framework especially when conducting work in the placement. Add to that, learning the goals of placement have encouraging me to participate actively in the placement. (Student 1).

The skills I performed is to know how to communicate with the clients, control my emotion because at Christian Care Centre it is compromise of different clients, both young and women who are been through different problems in their lives. So I need to understand their situation before interacting with them and not judgmental towards them. (Student 10)

The assessment tools are my key learnings for this week. Assessment tools such as the three house by Weld and Greening (2003) which can be used especially when working with children of abused cases. The risk assessment video on assessing and determining the risk of clients

when managing cases and the client plan and support plan (template) are also the new learnings for me. (Student 1)

Three Houses Assessment:

This assessment tool was created by Weld and Greening in 2003 and it used or utilized by social workers to get a quick picture on where things are at with their client. (Student 2)

Students identified the programme competencies of professionalism, Diversity, Ethics and Research.

The first 7 weeks of the semester brought me to a place of self-reflection because i was given so many cases at the same time and i was running out of how to manage my time well. I learned so many times about professionalism to cultural diversity and Ethics. I was so interested in knowing many cultural aspects and their dos and don'ts and things that we need to know as a social worker. (Student 9)

After completing these activities and I know that summarizing the case is one of the most important for the social worker to be mindful with in order to develop her skills and knowledge on how to summarize the case after the listening. (Student 5)

The skill I want to highlight out of this process is the overall research itself. It has taught me a lot from the start from selecting my research topic, to the objectives and questionnaire table, the literature review and the write up itself. The personal development growth is how to choose the relevant literature review and how to capture those important reviews in your research and analyse them. This critical analysis of the research topic is a very important skill in the future for research, work or simply for observation. (Student 6)

Many skills and competencies were identified by the 10 final year students in their engagement in the environment (situation) and their various tasks they were involved in. Their reflections, and their involvement in research required planning, integrating their learning from the tools provided and providing reflections.

Assessment Resources

Students indicated that they were given an array of tools which they utilized to assist them as Social Work practitioners. The Case Studies within the course also provided real-life scenarios that students may encounter, and teaches them how to manage these cases, follow—up on referrals, carry out assessments, complete cases notes, formulate plans, monitor and review plans, and learn how to close cases, and evaluate the service provided.

From the action plans that I was given, I had to find solutions to the issues presented, and I learnt a lot where I was able to use types of assessment tools to investigate the problem. For instance, psychological model, the three houses, SACS, sign of safety and the last one is immediate risk and need. Not only that but I was familiar some important practices to visit Fijian home, and Samoan. But from using these tools and I need some of my skills to develop which are action plan, and my interview skills. These skills and tools are value for me to guide me and improve more my knowledge to become a professional social worker. (Student 5)

The skills that I was get from these different cases I was able to apply different assessment tools to investigate the background or the environment of the client, understand the issue why is it happen. However, I was able to think outside the box to find better solutions for the issue

to every different cases. Not only that but I was able to understand the Fijian, Samoan, Niuean and Tongans greeting in order to greet them and some of their cultural practices like dressing, food, languages and the way social worker access the case. (Student 5)

The assessment tools are my key learnings for this week. Assessment tools such as the three house by Weld and Greening (2003) which can be used especially when working with children of abused cases. The risk assessment video on assessing and determining the risk of clients when managing cases and the client plan and support plan (template) are also the new learnings for me. (Student 1)

Assessment tools and their purposes were mentioned as identified as instruments for student practitioners and in the future as Social Workers

In this case, three case assessment tools were utilized. These were: 1. Substance And Choice Assessment Tool, 2. Three Houses Assessment tool, 3. Signs of Assessment, 4. The Client System Assessment and 5. Immediate Risks and Needs. (Student 2)

Apart from that, we also had to learn (through research or interviewing a Solomon Island colleague) about the helpful tips that a social worker must keep in mind before approaching or engaging with Solomon Islands Clients (Student 2)

An example provided by Student 2 was her summary of the Substance and Choice Scale (SACS) and its use with a particular population-adolescents.

This assessment tool is used to help the social worker in acquiring a quick and clear gauge of a client's substance use. This assessment tool is an AOD (Adolescent alcohol and other drugs) measurement instrument and can also be used to determine and identify substance used by the user and also determine a treatment. This assessment is used on adolescents aged 13-18 years. (Student 2)

With the combination of cultural experiences and equipped with an array of assessment tools, students recognized through their reflection their better knowledge of themselves, integration of cultural sensitivity, and assessment skills were necessary to their success as Social Workers in the Pacific.

Practical Skills – Processes and Organisation

From the STARL-P, students indicated that their placement provided them with practical skills, adapting and working in new environment such as the workplace, and working with clients. This included a variety of placements in different countries. This included students working in NGOs, Legal Unit, Case Work, Advocacy as well as accompanying clients. This hands-on experience involved the context i.e, the situation, learning the necessary tasks and actions, which in turn provided opportunity to reflect and learn.

I got a lot of skills and knowledge after completing my workplace hour where I was able to conduct an interview, provide a case note, assess the case with different assessment tools, counselling and also to do a presentation... I know that my weakness last year and last semester to improve from, watching different videos and readings and also from my field educator support. I got a lot of benefit where I was feeling light especially in my assignment. (Student 5)

In the last five weeks of placement, I engaged in casework, interview practice, group work, and case noting. (Student 3)

This is the organisation that I did my SW300 Fieldwork placement at and it is called Family Support Centre as you can see above on the picture. It is a non-government organisation dedicated to raising the status of women and children through the services it offers. It is located West side of the capital Honiara.... Family Support Centre has four departments and they are: Counselling Unit, Legal, Advocacy and Administration consisting of Finance and Management. (Student 8)

Time management and listing down activities are the most helpful to the school social worker to be mindful with her duty a day. (Student 5)

Legal unit is the second unit that I did my placement at. This unit consists of the lawyers of Family Support centre. Whenever a client needs legal assistance, they step in to help out with the client. Some of the duties that I did are which have gained more learning from are: Drafting of statements, Court accompaniment, data entry of clients, Protection orders, Communicate with clients through phone calls. Thus, during my placement in this unit I have learn so much from the legal unit staffs. (Student 10)

The last department that I did my placement at in Family Support Centre is Advocacy Unit department. In the Advocacy department I also learned many things concerning how to do awareness talks when visiting schools. . Thus, I have learned so many new skills like doing lobby and campaign, training skills, speaking skills and printing skills. Overall be the voice to advocate for the victims of domestic violence and child abuse in schools, communities to stop much violence affecting many children and women nowadays. (Student 8).

First week of my placement, I was placed under legal unit and the task given to me is by drafting of clients' case, sentence submission and calling clients by informing them about their days to attend their courts. Also accompany lawyers to court and when sees clients personally. Therefore, upon giving this task, at first, I find it quite challenging when it comes to drafting and interacting with clients because of shyness. (Student 10)

From the variety of placements and locations, students reflected on their wealth of experiences and skills they had acquired. Apart from working within new placement locations, working with clients or staff in the organization, students had to work in groups to create a presentation.

Collaboration (Group Work and Presentation)

Although each student was required to submit an ePortfolio with artifacts, the following comments by students illustrated the dynamics of group work, their collective decision making and their contribution.

I was able to raise my voice in my team to fight what is wrong in my groups. For instance, while we are doing the presentation and only one of my group members was did) not participate because she did not know so I make a contact to her, that our field educator already sent an email for our group members date and time for the presentation. I know that I was able to raise my voice in my team on what is right and wrong to find better solutions. (Student 5).

... I am so very glad that our group members are working well together. It took a few days to get all the group members onto our Viber group chat. Unfortunately, one group member

wasn't able to join us as he had chosen to do an individual presentation. I am glad that our group has a very good group dynamic where we were all able to discuss on zoom on what to do. At first, the group members were not clear on what to do, so we consulted our placement coordinator for his help. After our first group zoom discussion with our coordinator, it became clear to us on what to do... The group leader complied the presentation with all its recording and then she sent it back to us for clarification, if the presentation was good to submit. (Student 2).

Feedback and Support from the Teacher

Based on students' responses, students consulted their teacher for clarification and guidance throughout the placement. This was done predominantly via video conferencing-zoom group supervisions, emails, course announcements, or individual face-to-face meeting. Some of the students reflection included the following:

At first, the group members were not clear on what to do, so we consulted our placement coordinator for his help. After our first group zoom discussion with our coordinator, it became clear to us on what to do. (Student 2)

Our field educator already sent an email for our group members date and time for the presentation. (Student 10)

The Coordinator also provided feedback on the ePortfolios completed:

A very good e-portfolio is submitted. You have captured the key components that formed your learning and things you felt were important to highlight in your placement journey. Thanks, Soro (Student 3).

The design of the ePortfolio by the Coordinator and Instructional Designers provided the space for STARL-P to be embedded. STARL-P provided the prompts and guiding questions There was little complaint of not knowing what to do. However, there were some technology glitches.

Some links I cannot assess but giving a big thanks to Soro to response and fixed links easily in order to complete the task for this week learnings and activities to expand more my knowledge and skills especially on assessment tools. (Student 5)

Student 3 had a virtual placement rather than a face-to-face placement because she had difficulty in travel and childcare. The flexibility provided by the Coordinator enabled the student to complete her studies. She would not have had the opportunity to complete her placement without technology and thus fail to graduate.

The placement type I was in was virtual so I did not actually get to interact with clients. The only interaction I had was with my supervisor and we would meet through zoom once a week. (Student 3).

CONCLUSION, IMPLICATIONS AND SUGGESTIONS

The following recommendations are proposed to enhance the use and impact of e-Portfolios in academic learning in the South Pacific:

1. Contextualized Digital Integration

Institutions across the South Pacific should adopt e-Portfolios in a way that respects and reflects local cultures, values, and languages. Customizable templates and culturally relevant examples can help students connect more deeply with the platform.

2. Capacity Building and Training

Continue investment in training for both students and educators on effectively using e-Portfolios. The need for upgrades as well as investment in support Infrastructure such as consistent and affordable internet and electricity is important for student success.

3. Reflective Practice and Cultural Competency

Encourage e-Portfolio designs that encourage students to reflect on their cultural identity, community engagement, and ethical practice.

4. Monitoring and Evaluation

Utilise constructive alignment, and evaluation in higher education programmes to meet the learning needs of the Pacific.

This study focused on the phenomena of learners' reflection on their use of e-Portfolios in Social Work Fieldwork Placement Education at the University of the South Pacific (USP). Findings are based on students' responses and reflections illustrated that the e-Portfolio, when integrated with the STARLP (Situation, Task, Action, Result, Learning, and Professionalism) framework enabled students to actively engage with course content, reflect critically on their learning experiences, and interact meaningfully with peers and field educator. Students shared their experiences of applying theoretical knowledge in real world settings. They also were proficient in navigating the Mahara platform. The technology via e-Portfolio provided online opportunities for students to provide evidence of the development of relevant knowledge, skills, and values essential to the field of social work and a tangible way for the Coordinator to guide, monitor and evaluate learning.

AUTHORS' NOTES

Data Accessibility Statement

All underlying data to support the conclusions are provided within this paper.

Ethics And Consent

All participants provided written consent for this research

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Constructive Alignment as a Framework For Faculty Development in an Age of AI

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ABSTRACT

Higher education (HE) is being disrupted by generative AI (genAI), and many current efforts focus on imposing regulations and changing forms of assessment to avoid student misconduct. However, if changes are made to forms of assessment, but not to learning outcomes or teaching and learning activities, the result will be misalignment which detracts from the quality of teaching and learning. This paper argues that a more holistic approach can be adopted by employing Biggs' concept of constructive alignment (CA) and focusing on faculty development. Document analysis and participant observation were undertaken to investigate how faculty development in relation to genAI was conceptualised and initiated at a Danish university and how a CA guidance tool emerged in the process. Findings show that it is time-consuming for teachers to build AI literacy, but that time must be set aside for this, before faculty is ready to integrate genAI in their teaching. In addition, teachers prefer co-designed, tailored and contextualised activities, rather than generic, top-down approaches. The CA guidance tool not only reminded HE-stakeholders to focus on learning outcomes, teaching and learning activities, assessment and the creation of alignment between the three components but also constituted a boundary object that provided a joint language and structure for development and implementation processes. An important topic, missing in our data, is that of academic values. To build a good foundation for quality teaching, learning and assessment, stakeholders must consider what is valued in HE and make this an explicit component of courses and study programs

Keywords

higher education; generative AI; constructive alignment; faculty development; learning outcomes; assessment; learning activities; academic integrity; contextualisation; values

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INTRODUCTION

Higher education (HE) has been disrupted by the advent of generative AI (genAI) technologies and stakeholders are divided regarding what measures to adopt. Some call for immediate implementation to innovate teaching and learning and to support students in developing the competences needed for future employment (see e.g. Chiu, 2024). Others reflect on the impact of genAI on academic integrity and discuss whether these technologies should be banned in assessments to avoid student misconduct (Perkins, 2023; Yu, 2023). Still others call for a balanced approach and advocate the implementation of responsible AI, foregrounding ethics, fairness, transparency and accountability (Kurtz et al., 2024).

The disruption is caused by the increasing accessibility and user-friendliness of genAI services based on large language models and natural language processing technology, especially text services such as ChatGPT, Copilot and Gemini (García-Peñalvo, 2023; Kurtz et al., 2024). It is the ability of such generative services to produce text-output in response to user prompts and to successfully imitate various academic writing genres that are seen as a game-changer in HE (Kurtz et al., 2024). Some endorse genAI in the role of teaching assistant or student learning companion (Wang, 2023). However, the list of concerns is growing with scholars pointing to ethical questions, digital divides and educational inequality, inaccuracy and bias, lack of transparency, the undermining of human cognitive and learning processes, loss of human relations, values and agency as well as the demise of academic integrity (Bozkurt et al., 2024; Kurtz et al., 2024). There are also wider concerns that HE will become outdated and irrelevant if we do not act now and embark on transformation processes to align teaching, learning and assessment with the demands of a world with AI, and digital technologies more broadly (Chiu, 2024; Kurtz et al., 2024). This is not a simple task and will require that we also reconsider our understanding of authorship and agency in a world where we are entangled with AI, and other digital technologies (Jiang et al., 2024).

The question of authorship and agency is especially pertinent when it comes to assessment which is the most topical issue in relation to genAI (Chiu, 2024; Kirwan, 2024; Luo, 2024). Most often, genAI is seen as a threat to the current assessment system with the main problem being that teachers find themselves unable to gauge whether an assignment is the independent and original work of a student or the output of a genAI service (Perkins, 2023). A severe concern is the potential undermining of learning outcomes if students submit AI-generated content as their own (Wang, 2023). The argument is that this content will not give an accurate impression of the students' level of understanding and skills but could compromise assessment and devalue university degrees. Such concern arises from outdated and problematic views of agency, authorship and what counts as original work (Wise et al., 2024). In academia, the "lone genius in the attic slaving away on a piece of written work" (Johnson-Eilola & Selber, 2007, cited from Luo, 2024, p. 660) is still celebrated. Such views neglect that, today, there are few occasions when one is not assisted by and entangled with technologies when going about one's tasks, be these private or professional (Luo, 2024). This begs the question, how we can understand 'original work' today and suggests that we need to examine our perception of genAI and its role in student work. Is it a type of external assistance or have we now "come to a time when technology is blended into human thinking, writing and doing" (Luo, 2024, p. 659) producing a type of distributed agency (Code, 2025)?

Unfortunately, efforts to manage concerns in relation to assessment have focused on attempts to preserve existing notions of academic integrity and original work by introducing traffic light systems or assessment scales that signal whether AI use is banned, allowed to some degree or fully allowed

(Corbin et al., 2025). Common for these approaches is the casting of suspicion on students, making them responsible for upholding academic integrity by following the rules, and not cheating. Indeed, there seems to be a focus on getting students to adhere to rules and regulations as an end in itself (Dawson et al., 2024), with institutions failing to be transparent about what constitutes academic integrity. This poses the risk of HE becoming obsolete and out of sync with the activity and practices of a world with AI (Chiu, 2024; Kurtz et al., 2024). Also internally, however, the approaches taken to mitigate the impact of AI, can cause misalignment if assessment forms are changed, but teaching methods and learning objectives remain the same. Allowing use of AI in exams means including digital competences, such as AI literacy, as a hidden curriculum. If not taught explicitly and not included as new learning outcomes, this will pose unfair conditions and create inequity between students who already possess such skills and those who do not (Chiu, 2024).

The above outline of concerns and solutions evidences disjointed debates and initiatives. Many HE-teachers have difficulties navigating the field and are left with little guidance with respects to integrating AI in teaching, learning or assessment. Several publications share recommendations for the integration of genAI in HE and highlight faculty development as essential. Kurtz et al. (2024) very bluntly posits that “as with any ICT change, the onus of incorporating generative AI into the academic curriculum rests squarely upon the shoulders of teaching staff, underscoring the critical need to enhance a faculty’s proficiency in these emergent technologies” (p. 5). To Kurtz et al. (2024), faculty development is partly about teaching staff “actively immers[ing] themselves in AI technology, thereby expanding and enriching their domain-specific knowledge and pedagogical strategies” and partly about a change of mindset in which the transformative potential of genAI services is acknowledged and the need for “recalibrated design of academic programs” is realised (p. 5). This puts heavy demands on teaching staff and case studies are needed to illustrate how such integration of AI can be managed in practice. This paper aims to contribute and reflect on such a case study.

Acknowledging that more holistic approaches, rather than one-sided focus on assessments, must be adopted to help teachers navigate a world with AI, this paper explains and discusses how Biggs’ (1996) concept of constructive alignment (CA) can be used as a framework for faculty development and as a guidance tool in relation to the integration of genAI. CA puts students in the centre and provides an opportunity to contextualise AI, securing quality teaching, learning and assessment.

Below, we first outline our theoretical framework, followed by an account of methods employed. Subsequently, we present our findings that illustrate how faculty development in relation to genAI was conceptualised and initiated at a Danish university (the University) that constitute our empirical case. Our findings also trace the emergence of a CA guidance tool that originated in the University’s centre for teaching and learning (CTL) and gradually came to frame both faculty development initiatives as well as university-wide action plans. Finally, we discuss our findings and offer concluding thoughts.

THEORETICAL FRAMEWORK

In this section, we introduce the concept of constructive alignment (CA) and discuss its strengths as well as the criticism levied. Drawing on recent literature on genAI in HE, we highlight suggestions for future foci within each of the three components of CA. The section ends with an outline of the theoretical underpinnings of the faculty development approach employed at the case university.

Constructive Alignment

CA is a design framework that was developed to support the transition from the then dominating transfer paradigm in HE that focused on what the teacher does, to a constructivist paradigm, focusing on what the students do (Biggs, 1996, 2014; Biggs & Tang, 2011). The teacher was no longer to act as a transmitter of knowledge, but should, instead, take on the role of designing for students' active meaning making and knowledge construction by using the principles of CA. CA was developed in the context of massification, student diversity, internationalisation and large cohorts which necessitated a rethinking of approaches to teaching and learning (Loughlin et al., 2021). CA builds on constructivism and instructional design and aims to show how significant traits of constructivism can be operationalised when planning teaching and assessment with the aim of enhancing student learning in a changed HE environment (Biggs, 1996).

The starting point in CA is the formulation of intended learning outcomes (ILOs), followed by the creation of teaching and learning activities (TLAs) that support students in working towards the ILOs. Finally, assessment tasks are designed and matching criteria, for example in the shape of rubrics, are formulated to enable the assessment of student performance in relation to the ILOs (Biggs, 2014). ILOs must be formulated at the proper cognitive level considering the students and the context. In HE, higher order ILOs are especially important and "require open ended tasks, allowing for unintended outcomes" (Biggs, 2014, p. 9). Embedded in CA is also the point that it will not suffice to make changes to only one of the three components in the framework. Changing one component should involve the recalibration of the other two, thus realigning all three components (Biggs, 1996). It is highlighted that CA is not a prescriptive method with the argument that this would go against constructivist principles; rather it is a way of focusing teachers' attention on the students and the students' worlds (Biggs, 1996), and of creating opportunities for students' meaningful engagement in learning.

In his 2014 article, Biggs states that CA is now widely used in HE and offers examples of different uses. However, he also addresses some of the criticism levied, for example, that CA is a return to behaviourism with predetermined outcomes, a rigidification of teaching and enforcement of conformity. Biggs (2014) refutes this criticism by reminding that ILOs are designed by the teachers themselves and that students should be granted flexibility in how they evidence their performance in assessment tasks. More recently, CA has been criticised for focusing solely on cognitive learning outcomes, neglecting potential learning outcomes in the affective or psychomotor domains that hold potential to innovate HE (Colding, 2019; Pratschke, 2024). Likewise, Colding (2019) questions the capacity of CA when it comes to the design of more complex, interdisciplinary study programs.

Today, the main criticism of CA stems from its widespread integration in institutional, national and regional policies where outcomes-based models are adopted as top-down, managerial tools for quality assurance (Loughlin et al., 2021). Biggs (2014) claims that CA makes a good fit with outcomes-based education but cautions that CA should be used as a theoretical underpinning of quality enhancement rather than for the formulation of key performance indicators (KPIs) in rigid quality assurance systems which do not belong in academia. However, much current use of CA is skewed towards KPIs and accountability, rather than enhancement, and Loughlin et al. (2021) state that we must reclaim CA and reinstate it as a "tool for reflection to aid the creation of optimal learning situations" (p. 132).

Another strand of criticism stems from postcolonial scholars who have examined Biggs' work more broadly and argue that it "contains a problematic conception of student ability, the nature of

understanding, and the purpose of education” (Newby & Cornelissen, 2025, p. 2). From this perspective, CA is not a neutral tool but a pedagogical theory that, when put into practice, deprives students of agency and limits the possibility for teachers to employ alternative pedagogies. In this way, CA becomes a barrier to efforts to decolonise the curriculum and design for diversity, equity and inclusion (DEI) in HE. Newby and Cornelissen (2025, p. 3) view CA as a tool to ‘facilitate standardisation, police alternative pedagogies, and discipline the workforce’ and therefore advocate its abolishment.

However, Rietig (2023) shares a more open interpretation of CA and explains how the framework can be used to firmly embed the personal growth mindset in courses and study programs. This involves learning outcomes in the affective domain, such as for students to build perseverance, adopt “try, try again” strategies and reflect on feedback and experiences. TLAs should include multiple learning loops of experimentation, reflection and trying again, and formative assessment should be employed. In addition, Rietig (2023) proposes that DEI, sustainability as well as decolonial agendas be engaged in the planning process, and that students be involved. Such an open reading of CA enables the embedding of other types of learning outcomes than the cognitive and supports the design of courses and study programmes with interdisciplinary components represented by, for example, the sustainability agenda.

Constructive Alignment In an Age of AI

Below, based on recent literature, we consider the implications of genAI for learning outcomes, TLAs and assessment in HE. Our aim here is to highlight that the issues around genAI mentioned in the introduction, cannot be resolved by making changes to one of the three components of CA, for example assessment. All parts must be recalibrated to reach a new equilibrium.

Learning objectives

According to Pratschke (2024), the knowledge, skills and competences that students must develop are shifting due to, amongst other things, genAI technologies. This shift also involves considering how we define human competence, how we define AI competence and how we define disciplinary competences in a world with AI. Several scholars advocate the inclusion of AI literacy for both students and teachers (see e.g., Chiu, 2024) to enable them to learn and work with genAI. In an exploratory review, Ng et al. (2021) propose four aspects for fostering AI literacy, namely know and understand, use and apply, evaluate and create, and ethical issues. In addition, they use Bloom’s taxonomy to describe learning outcomes at different cognitive levels of learning. New learning outcomes within the affective domain are also outlined, for example adaptability skills, resilience and self-confidence in the meeting with and effort to master new technologies (Chiu, 2024). This widens the scope from genAI to digital competences more broadly and highlights the importance of mindset and approach rather than specific competences (Christensen, 2024). However, moving forward, it is not only a question of identifying new learning outcomes but also of explicating what has today become tacit knowledge, namely what we value in HE. If we want to preserve our values, we must find a way to articulate them in relation to, for example, academic integrity, critical thinking and transparency (Bearman et al., 2024; Gee, 2024; Kurtz et al., 2024).

Teaching and learning activities

Chiu (2024) suggests better personalised learning, enhancement of conversation, interaction and feedback and points to the necessity of switching from knowledge transfer to knowledge processing and from disciplinary to interdisciplinary learning. He likewise stresses the inclusion of foundational

activities, so that students have the basis for evaluating the output of genAI within their discipline (Chiu, 2024). Several scholars stress the importance of preserving the human element, claiming that social and collaborative spaces for learning are essential as well as “practices and contexts that empower humans” (Gee, 2024, p. 1099). On a more practical note, Bowen and Watson (2024) provide guidance for the development of TLAs using genAI as a tool. They provide a wealth of prompts that can help teachers get started on the AI-supported design of questions and structures for classroom discussions or new assignments that enhance student engagement and motivation. For Bowen and Watson (2024), it is important to secure student effort in learning, and to this end, they propose adopting a process-focus in assignments where students are guided through tasks that involve iterative prompting, reflection and improvement of prompts and output. In addition, Bowen and Watson (2024) highlight the need to promote student agency, seeing this as an important motivator for learning. They propose to do so by scaffolding their “journeys of discovery” with checklists and feedback. These latter points are also relevant when designing assessments.

Pratschke (2024) suggests using Laurillard’s (2012) Conversational Framework as a starting point for developing TLAs with and for genAI. The framework presents six learning types that each constitutes an important learning process underpinned by learning theory: acquisition, investigation, discussion, collaboration, practice and production. The framework helps teachers adopt a student perspective on the learning experience, thus connecting with the intentions of CA. The framework also stresses the importance of interaction, collaboration and dialogue for learning, emphasising the human element. It can therefore serve as a useful and well-founded springboard for the development of TLAs with the teacher carefully considering how genAI can be meaningfully integrated in each of the six learning processes, thus supporting students’ “active generative learning” (Pratschke, 2024, p. 66).

Assessment

A shift from summative to formative assessment is suggested, as well as individualised, student-centred assessment activities (Chiu, 2024). This could involve assessment as in-class activities or students submitting a collection of artefacts that demonstrate their creative skills using different genAI services. This resonates with the point that the focus in assessment should be process rather than product (Corbin et al., 2025; Pratschke, 2024). Others suggest open ended assessment that focuses on higher levels of Bloom’s taxonomy (Wang, 2023). This fits well with the call to employ forms of assessment that requires problem-solving, critical thinking and creativity (Bozkurt et al., 2024). Finally, Wise et al. (2024) state that authentic assessment is the only option and explain how writing scholarship can offer valuable advice. Written assignments posed in HE are all too often vague and decontextualised, representing a missed “opportunity to encourage students to mobilise knowledge and share it with specific readers” (p. 582). Authentic assessment is one of the principles of alternative assessment which could be the way forward, since the shortcomings of traditional assessment methods have now been revealed (Pratschke, 2024). In continuation of the call for rethinking agency in an age of AI made in the introduction, Human + AI assessment must also be considered. This type of assessment involves acknowledging the use of AI to augment human intelligence and to accept co-created work on assessments (Pratschke, 2024).

According to Gee (2024, p. 1100), the “goal [of assessment] is not to judge but to help learners develop an ‘appreciative system’—their values, sense of quality, and self-assessment in a particular field”. This connects well with the need to explicate our values in HE mentioned above and is a good way of moving forward to reify academic integrity.

Next, we turn to the theoretical underpinnings of the faculty development approach employed at the CTL.

Faculty Development Approaches

The last two decades of digital education have laid a strong foundation for digital pedagogies, models, and learning design frameworks that can be employed when planning faculty development initiatives for the age of AI (Pratschke, 2024). The CTL has gained valuable experience in making it meaningful and motivating for teachers to adopt educational technologies and digital tools in teaching by grounding faculty development in principles of adult and work-based learning, training practical skills and focusing on contextualisation (Christensen et al., 2018). According to Pratschke (2024), digital pedagogies built on evidence-based practice is still relevant when integrating genAI into teaching and learning, but there is a need for multifaceted approaches to faculty development to foster a comprehensive understanding among teachers of the capabilities and limitations inherent in genAI tools.

Kurtz et al. (2024) suggest that teachers should be encouraged to actively engage with genAI and propose a genAI adoption model with courses of action to facilitate progress from a novice stage to a transformative level of adoption. They recommend that teachers use genAI for research and administrative tasks to ease into AI literacy. This connects well with the principles of training practical skills and adult learning, as adults are most likely to engage deeply with learning when it connects directly to something they are genuinely interested in or see as necessary for achieving a personal or professional goal (Illeris & Associates, 2004). Work becomes the curriculum for faculty development, where participant-driven and problem-oriented approaches provide optimal conditions for integrating work and learning. This also involves taking each teacher's specific challenges within their own teaching and assessment context as the starting point for development. Likewise, it includes the introduction of relevant genAI resources, showcasing practical teaching and assessment cases that teachers can implement in their own practice, and supporting them in completing tasks they would need to do anyway to prepare for upcoming teaching and assessments.

Educational developers play a significant role in identifying faculty development methods that make sense to teachers and supporting them in contextualising AI in a safe and supportive environment. Pratschke (2024) emphasises that contextualising and embedding genAI requires access to frontier AI models, which universities should prioritise alongside funding the development of secure in-house solutions. She also highlights forming communities of practice, where teachers can “learn from each other's experiments, successes and failures” (p. 117). This connects well with Kurtz et al.'s (2024) proposed faculty development approaches that focus on discussion groups to promote peer learning and the exchange of experiences. Kurtz et al. (2024) also highlight personalised training sessions tailored to individual teacher needs as effective means to support the adoption of genAI in teaching. This aligns closely with CTL's approach to faculty development, which prioritises tailoring initiatives to specific faculty groups, but also providing initiatives for individual teachers. When teachers from the same faculty work together, they can better align learning outcomes, TLAs, and assessment strategies across modules or a program. Contextualising discussions and development activities within a specific discipline, will also make the learning experience more relevant and immediately applicable. The CTL also employs the learning circle format to support individual teachers in setting personal development goals, self-regulating their learning, and engaging in knowledge exchange with peers within a supportive community of practice. These circles typically consist of up to five participants and a

facilitator, and they combine self-study, online or face-to-face meetings, and practical application in teaching. This structure ensures that faculty development remains relevant and directly transferable to each teacher's own context (Lahdenperä & Marquard, 2024).

The next section accounts for the methods employed.

METHODS

Research Method

This research is part of a 3-year study that uses design-based implementation research (DBIR) (Fishman et al., 2013; LeMahieu et al., 2017; Penuel et al., 2011) to investigate how to support the integration of digital competences, including those related to AI, in courses and study programs at the University. This research method was chosen because it involves stakeholders from the outset, aiming to create ownership of developed solutions and a capacity for change. In DBIR, several levels of the organisation are engaged to identify challenges and to design, test and refine solutions, which include implementation supports, thus paving the way for implementation already during the lifetime of the study. DBIR follows the following four principles (Fishman et al., 2013, pp. 142-143) that outline tasks, processes and stakeholder participation:

The four principles of DBIR:

1. Focus on persistent problems of practice from multiple stakeholders' perspectives.
2. Commit to iterative, collaborative design.
3. Develop theory related to both classroom learning and implementation through systematic inquiry.
4. Develop organisational capacity for sustaining change in systems.

In this paper we inquire into the problem of practice: What faculty development initiatives and tools are needed to guide teachers in an age of AI?

Empirical Case

The empirical case demonstrates how an approach for integrating genAI in education was established at a research-intensive, Danish university. Both opportunities and challenges were handled differently across the University after the launch of ChatGPT 3.0 in November 2022, and navigation was largely left to individuals. Faculty management viewed genAI as a threat to current assessments, leading to growing concern and subsequent efforts to identify and redesign assessments that were judged to be particularly sensitive to AI. This highlighted the need for creating a common foundation for working constructively with genAI in education rather than banning the technology. In April 2023, the University launched Project generative AI in education with a kick-off event where representatives from all stakeholder groups – managers, researchers in AI, administrative and teaching staff, educational developers and students – were involved in interdisciplinary discussions about the implications of genAI for the University. On this occasion, proposals for initiatives regarding genAI were developed and subsequently reviewed by the University's Educational Council (coordinating forum for strategic matters concerning education manned by the vice deans and chaired by the prorector) who then decided how to move forward. The following three work groups were formed and manned by a mix of teaching staff and technical-administrative staff with subject-matter expertise and viewpoints, with the aim of ensuring broad representation from the University's five faculties.

- Work group 1 was to establish rules for students regarding the use of genAI in teaching and assessment.
- Work group 2 focused on identifying faculty development needs.
- Work group 3 was to provide guidance for staff and students on GDPR, copyright, and IT-security relating to genAI.

In the Findings section below, we present the output of work group 2, the subsequent phase of designing faculty development initiatives, the emergence of the CA guidance tool and preliminary results of the implementation.

Data Collection

To obtain a faithful account of the process that led to the design and implementation of faculty development initiatives and the emergence of the CA guidance tool, documents such as agendas incl. appendices for and minutes from council meetings were reviewed and those pertaining to genAI in relation to teaching and assessment were selected for analysis. In addition, texts from the Project generative AI in education website were retrieved for analysis. These documents were used as a data source in our qualitative inquiries to develop empirical knowledge (Bowen, 2009) and were an important means of validating the results of our second data collection method, participant observation. This is one of the strengths of document analysis according to Bowen (2009) who also point out the usefulness of the method for single case studies such as ours, since documents provide insights into context and data on past events.

Author 1 is a researcher employed at the Faculty of Humanities at the University, and author 2 is a senior e-learning consultant employed at the University's CTL. As part of our job, we had ample opportunity to undertake participant observation (Spradley, 1980) by participating in meetings at the CTL, where genAI, faculty development and the CA guidance tool were on the agenda. Likewise, we were both in charge of designing and delivering different types of faculty development pertaining to genAI and/or digital competences more broadly. We also participated in meetings with other stakeholders at the University, such as faculty management, educational developers, e-learning consultants, heads of study and students. During events, we made field notes and following the events, we noted down our impressions and reflections.

Researcher Positioning

As we investigate our own organisation, we can be characterised as insider researchers. As insiders, we possess a priori knowledge of our organisation and already have an understanding of HE-stakeholder groups and the typical perspectives of and tensions between these. This helped us orient ourselves in the research environment and with participants, which is one of the advantages of insider research (Greene, 2014). However, there are also disadvantages, such as insider bias or the researcher being too subjective, lacking the ability to distance themselves sufficiently to undertake credible research (Greene, 2014). It should be noted that author 1 and author 2 are looking from different positions in the organisation, namely that of a researcher and that of a senior e-learning consultant which brought diverse perspectives into play and helped uncover blind spots caused by the familiarity with the environment. From an ethical point of view, disclosure is important in insider research, so that participants know that they are the subject of research when interacting with the insider researcher. Therefore, author 1 presented her study at the outset of any event that presented a data collection opportunity.

Data Analysis

Document analysis was undertaken by carefully reading through and then synthesising the data in the selected documents (Bowen, 2009). The same process was carried out with the field notes from the participant observation. This was followed by content analysis (Krippendorff, 2019) of the synthesised data. The content analysis focused on tracing the conceptualisation and initiation of faculty development initiatives and the emergence of the CA guidance tool, including problems addressed, development process, purpose and design, as well as stakeholder responses. As a further means to secure the validity of findings, member checking in the form of review of analysed data (Lloyd et al., 2024) was employed. We presented our findings to and discussed them with the head of the CTL who had been one of the originators of the CA guidance tool. The purpose was to uncover any misinterpretations on our part and elicit information that could further improve the accuracy of results.

Below, we present our findings from the document analysis and participant observation.

FINDINGS

Work group 2 that focused on identifying faculty development needs, engaged in dialogue with heads of study, teachers and pedagogical consultants at the five faculties, and found that staff involved in teaching often struggle to articulate their actual development needs in relation to genAI. Many teachers had not yet begun experimenting with genAI tools in early 2023 which limited their understanding of possibilities and limitations. The work group therefore developed a list of faculty development initiatives which they recommended be prioritised immediately. The aim was to make it easy and attractive for teachers to begin experimenting with genAI, and there was a strong emphasis on hands-on exercises focused on the development of teaching practices and the integration of genAI. The work group chose not to address subject-specific integration of genAI or student digital competences at this stage, suggesting that these areas be explored in a future phase.

The CTL was responsible for developing initiatives based on the identified needs and underpinned by their approach to faculty development. The following, short-term activities were developed in 2023:

- Online self-paced course (estimated workload: 30 minutes), designed as a required foundational course to be completed before engaging in other faculty development activities. Course aim: To provide a basic introduction to genAI and an understanding of its potentials and limitations.
- On-demand workshops (1 to 3 hours) designed in collaboration with the participating faculty group, tailored to their specific needs and context with a focus on:
 - Getting started using genAI tools for planning teaching and supervision.
 - Evaluating and re-designing assessment questions to adjust these to an age of genAI.
- GenAI learning circles, where up to five teachers and a facilitator meet regularly - either online or face-to-face - in an action-based learning process that includes self-study, synchronous or asynchronous participation, and practical application in participants' teaching.

In the process of co-designing the initiatives outlined above with managers from relevant departments, it became clear that teachers were not yet ready to engage at the proposed levels. A general introduction to genAI technology and specific tools was needed first to build initial knowledge.

To accommodate teachers, such introductions were typically delivered in already scheduled teacher seminars or meetings. Following this initial introduction, teachers were more prepared to engage, and this engagement first and foremost took place as dialogues with the CTL to co-design one or two, tailored, follow-up workshops, focusing on the use of genAI in teaching and/or assessment.

In August 2024, the implemented initiatives were evaluated at a council meeting. The conclusion was that the activities developed so far had reached too few participants. As a result, the vice deans were asked to apply leadership pressure to ensure broader participation. At the same meeting, the CA guidance tool was presented by the head of the CTL as a way of supporting teachers and heads of study in their efforts to integrate genAI. With the initial one-sided focus on assessment, there was the risk of misalignment between outcomes, TLAs and assessment, in courses and in study programs. The tool, based on CA, contains a set of reflection questions that was to guide the redesign and recalibration of all three components (see figure 1), thus offering a more systematic, pedagogically founded, approach and avoiding disjointed integration. The reflection questions within each area are arranged in order based on the extent of their implications for teaching practice and the number of colleagues involved in decision-making.

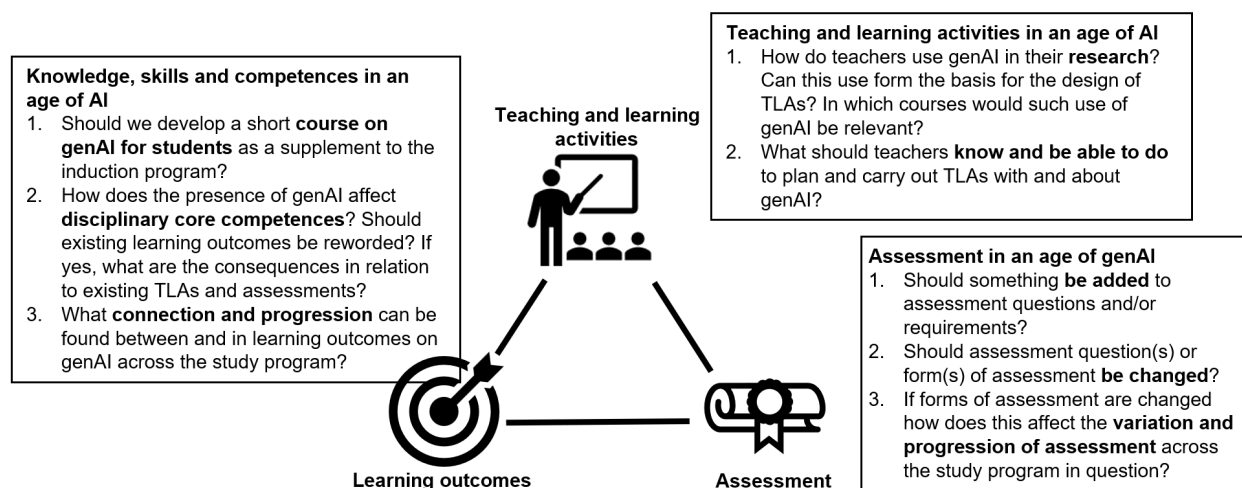


Figure 1. CA guidance tool (reprinted with permission from the CTL).

At the August meeting, the CTL was tasked with the mapping of existing activities, since at this point, several faculties had already initiated or were planning to initiate projects addressing genAI as part of a broader effort to implement digital competences in education. The council wanted an overview of these efforts to be able to identify synergies and possibilities for joint efforts and support. The results of the mapping were presented at a meeting in October 2024 and showed that the projects and initiatives launched reflected one or more of the three areas of CA. “This reminds us”, wrote the head of the CTL in the recommendation, “that the integration of digital competences in curricula demands changes in TLAs and should be reflected in forms of assessment as well as assessment questions through a redesign of these” (Appendix for the October 2024 council meeting).

A noticeable change has occurred in the meeting documents from the August to the October meeting. In the former, the agenda item is called “Future work on genAI in teaching”, whereas the agenda item on the October meeting is “Implementing digital competences in study programs”. This evidences the University’s shift in focus from genAI to digital competences more broadly and from teaching to study programs. The agenda for the October meeting specifies that this concerns the further work to

integrate genAI in teaching, but also that this will be part of a wider effort to integrate digital competences in study programs.

At the October meeting, it was decided to follow-up on the work at each faculty to integrate genAI and digital competences more broadly. The council found it necessary for the faculties to review all study programs on all three components of CA. For this task, the CA guidance tool was presented anew, and it was noted in the minutes that the reflection questions can guide efforts to integrate genAI, and digital competences more broadly, in study programs by offering three possible entry points for redesign (learning outcomes, TLAs or assessment) depending on local contexts and concerns. Thus, the suggested use of the tool deviates from the CA principle of starting a redesign or design process with learning outcomes. In the document describing the tool, it is emphasised that it is up to each local context to determine whether it makes most sense to begin the work from a learning outcome, TLA, or assessment perspective. The framework is not intended as a step-by-step review of curricula to identify changes needed, but rather as a reflection tool that can help highlight the areas where development and follow-up are needed.

The council decided that the follow-up on the faculties' work to integrate digital competences will be part of the QA processes already in place and requested all boards of study to examine what changes are needed to learning outcomes, TLAs and assessment, and to secure alignment between these. Faculties were also requested to develop a plan for implementation of the identified changes. The head of CTL proposed a format for follow-up reports based on an elaborated version of the CA guidance tool. It is noted in the minutes from the meeting, however, that the council remarked that the elaborated tool (a total of 10 questions) can be perceived as a proposal for a rigid review of curricula. However, the head of the CTL emphasised the role of the tool as a guide that can point to relevant areas for development and follow-up. The minutes note that the council supports the suggested use of the tool. The tool thus emerged as a frame for university-wide action plans. This shift in use and widening of scope illustrates the flexibility and usefulness of the CA principles.

The analysis of our field notes show that the CA guidance model has been well received at the faculties and has served as a tool to identify which areas should be prioritised locally. The model has also guided the CTL in showcasing genAI use and developing further faculty development initiatives (see below) with the aim of providing more comprehensive support for teachers and heads of study.

- Learning outcomes
 - On-demand workshop for heads of study and module coordinators to explore the concept of digital competences and provide examples of integration in courses and study programmes.
 - Web resource to support the integration of digital competences by establishing a shared language to systematically explore digital competences and make informed decisions about which ones are relevant for individual courses and study programmes.
- Teaching and learning activities
 - A mandatory workshop on genAI in teaching, included as part of the Lecture Training Programme (LTP).
 - A learning circle as part of the elective courses in the LTP with focus on planning and teaching with genAI.
 - A cross-institutional course developed in collaboration with two other Danish universities. The course aims to provide teaching staff with opportunities to explore

genAI with colleagues and students within their specific disciplines, enabling them to gain practical experience.

- Assessment
 - Online self-paced course that aims to support teachers in developing basic assessment literacy.
 - Web resource on assessment designed to inspire the enhancement of existing formats and offer ideas for updating or developing new assessment formats.

The work to integrate genAI and digital competences more broadly continues at the University. However, barriers have been identified: GDPR-compliant tools must be made available, clear rules of use must be established, and faculty and department management must provide their back-up and the necessary resources. Whereas, early management back-up is clearly evidenced in our data, the issue of access to GDPR-compliant tools have just now been resolved. As to resources, funding has been secured from national bodies and new projects are being launched.

DISCUSSION AND CONCLUDING THOUGHTS

Above, we have contributed a case study on faculty development and guidance in an age of AI. It may not constitute best practice, but it provides a description of authentic processes and their outcomes. Our findings show that faculty development is a slow process and that time is needed to gradually build teachers' AI literacy before launching into actual integration in teaching and assessment practices. Next, we noted that preferred development activities were tailored initiatives, rather than generic, top-down offers. This connects well with the principles of adult and workplace learning adopted by the CTL and highlights the importance of co-designing initiatives with faculty.

The CA guidance tool was introduced to remind HE-stakeholders at the University that quality learning is supported when learning outcomes, TLAs and assessment are aligned, highlighting the importance of recalibrating the entire system if introducing new components or making changes to one part of the system. The intention of the CTL was to use CA as a pedagogical tool that could frame the integration of genAI; however, our findings show that the CA guidance tool has the potential to fulfil multiple roles. Drawing on sociocultural theory (Vygotsky, 1978), we can view the tool as a scaffold that can provide teachers with the guidance needed to put students at the centre when they plan their teaching. CA helps break down the task of planning one's teaching into three steps and clearly outlines what is contained in these three steps. In this way the task becomes manageable for teachers, and so within their "zone of proximal development" (Vygotsky, 1978). At the same time, CA becomes a boundary object (Star, 2010) that helps establish a shared language between HE- stakeholders in general and provides structure for planning and implementation processes.

Our data also evidences a certain impatience to move on at the strategic and management level as overall decisions are made on direction and initiatives, with projects being launched to then secure implementation. This impatience can be seen in the agendas for council meetings, where the attention shifts from faculty development to redesign of courses and study programs in October 2024. At this point, faculty development initiatives were available but only few teachers had built sufficient AI literacy to integrate genAI in their teaching. Our conclusion is that faculty development is not satisfactorily addressed at the operational level, and this must be remedied. It is especially important to provide a safe space and set aside time for discussions and experimentation in peer learning settings (Kurtz et al., 2024; Pratschke, 2024). However, we welcome the shift in focus from genAI to digital

competences more broadly that also occurred in October 2024 as a formalisation of faculty management discourse based on a new strategy to secure digitally competent graduates. Such broader focus on digital competences, including genAI can help build resilience and more robust approaches to digital technologies moving forward (Weller & Anderson, 2013).

A surprising discovery was that some council members at the University were worried that the CA guidance tool in the elaborated version for follow-up on the integration of digital competences in courses and study programmes would be too rigid and confining. This evidences that academic freedom is still valued and that management does not wish to provide strict guidelines for redesign processes. This contradicts current criticism (see e.g. Loughlin et al., 2021).

We find that something is missing in the formal documents we have analysed, as well as in management and faculty discourse where problems around assessment and academic misconduct are still in focus. The topic that we would like to foreground is: What do we value in HE? In line with other scholars (Bearman et al., 2024; Gee, 2024; Kurtz et al., 2024), we encourage all HE-stakeholders to be more explicit about academic values and to also integrate these values in learning outcomes, TLAs and assessment. For too long, our values have been tacit and overshadowed by mistrust and regulations. This is not a good foundation for quality teaching, learning and assessment in HE.

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Achieving Viable and Sustainable Education at the Community College Level

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ABSTRACT

This Sustainable Delivery Framework is a solution to serve any learner, anywhere, while also enabling community colleges to scale offerings and fulfill the mission to transforming lives and communities. This project aims to embrace inclusive and open education practices to enable multi-access learning options for learners anywhere, anytime, with the outcome of increasing access and enrolment. This framework builds on global and local research, sector reports, surveys of learner expectations, emerging technological opportunities, and current economic realities. The resulting model supports learners throughout various life stages, recognizing prior skills, knowledge, and abilities as the college moves from course-based programming to learning outcome/competency-based learning practices. Changing the unit of analysis in education progression supports sustainability and fosters a more adaptable education approach. The Sustainable Delivery Framework is seen as a solution to develop an inclusive and viable community college able to serve its region while providing quality learning informed by place and future-forward skills. This framework seeks to empower educators and learners with necessary tools and supports to provide flexible approaches allowing individuals to learn as they require. The Learner Navigation component of the framework supports learners to create individual educational pathways, building on their unique knowledge, skills and abilities to achieve their goals. Recognizing existing knowledge fosters a learning environment that welcomes diverse learners and invites their prior knowledge, including Indigenous and cultural knowledge, to be woven into the learning experience enriching all learners.

Keywords

lifelong learning, inclusive education, college, higher education, competency-based, multi-modal delivery

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VIABLE AND SUSTAINABLE DELIVERY FOR COMMUNITY COLLEGE

Post-secondary institutions are actively seeking innovative approaches to address inequitable access and update outdated delivery models to address emerging issues such as evolving technological advancements, decreasing enrolment, and shifting student demographics. These efforts are driven by the need to ensure educational currency and sustainability in a dynamic and disruptive global environment. By embracing digital tools, personalized learning experiences, and flexible delivery structures, institutions aim to enhance accessibility, social engagement, and relevance, thereby preparing learners for the challenges of the future while maintaining institutional viability. Finding a common purpose to unify the focus is a daunting undertaking in these turbulent times.

In the recent past, within Canada, many institutions compensated for this impact on revenue by increasing the recruitment towards international students (Higher Education Strategy Associates, 2024). When policies on immigrant changed, this revenue stream became interrupted. While this reliance on international students has been the trend, concurrently the government spending on higher education has been dropping in most provinces (Higher Education Strategy, 2024). In British Columbia, there had been a slight increase for the period of 2013-2022 (Higher Education Strategy, 2024, figure 4.2 p. 43) although this observation is recognized as dated information in these rapidly changing times. As the various provincial and federal governments struggle with deficits, this college is looking to expand its sustainability by reducing its dependency on government funding and increasing access for learners. By focusing on “right and sight” responses as defined by Cecil (2025, p. 10) the College is aligning with new fiscal realities and concentrating on targeted strategic actions to ensure long term sustainability.

LITERATURE

This Sustainable Delivery Framework (SDF) was developed in response to emerging challenges in post-secondary education and to ensure the College has a sustainable education delivery model in place. This work commenced with a comprehensive literature review, evaluating reports from World Economic Forum (2025), EDUCAUSE (Muscanell & Gay, 2025), Academica Group (2025), Higher Education Strategy (2024), UNESCO (2016, 2022, 2023a, 2023b, 2024), UNESCO & International Commission on the Futures of Education (2021) and other national, international and local sources focused on both educational and work forecasting. In striving to be relevant and economically sustainable in the dynamic and global world, an aspiring framework gradually emerged, one capable of supporting and expanding the College into the future.

Over the past two years, the project continuously reviewed materials emerging exploring forecasts for: population growth in the local area, trends in technology, and education, and economic predictions. This ongoing review deepened the understanding of emerging values, ensuring their incorporation into the evolving plan. Most of the resources can be found through the [digital resource list provided by the College Library](#). New information has been identified on a weekly basis, adding currency and context to the valuable conversations.

METHODS AND APPROACHES

This project started as part of the larger organizational strategic plan, Inspire (Okanagan College, 2022), and was supported through executive sponsorship. The Inspire plan is a multi-year initiative broken into projects to move the organization in a new direction. These projects generally run one to two

years in length and build a foundation for actionable next steps and are transparent with annual reporting to the broader college community. Using this approach, there is opportunity for more individuals to become part of the overall progression forward and see their own part in the big picture.

This project began with a diverse team from varied backgrounds and positions. This wide scope of membership challenged ideas on how best to serve the broadest range of learners, while creating a vision capable of supporting future communities of learners. Perspectives from health, administration, information technologies, teaching and learning, education, business, and trades as well as perspectives from individual in other various roles throughout the organization all contributed to the development of this framework.

Our approach started with a regional socio-economic analysis, researching who the people are living in the areas supported by the College. This demographic and the forecasted distribution of population available through BC Stats (n.d.) was used to help identify opportunities to better align and serve community needs. Over the span of the project, several approaches were used to build on reports explored and to balance organizational realities. Stats Canada population projections, recent disruptions, and the current changes in student demographics and declining enrolment created have created the urgency needed to find different delivery model approach. Internal reports (Hutchinson & Clement, 2019; Okanagan 2023a, 2023b, 2023c) informed by learner consultation identified digitally enhanced learning, flexibility and multi modalities as optimal ways to increase reach and viability. These reports spanned pre-and-post-covid periods and showed a strong match with emerging research and projections. After the work commenced, changes in federal policy regarding international students were announced. This federal shift only validated it is paramount for the institution to ensure economic sustainability in its operations.

Foundational articles included work by Orr, Weller and Farrow (2018) and Johnson (2023) where initial ideals of how to achieve any learner, anywhere, any time were based. As the work evolved, more resources and values influenced the evolution towards the current framework. Returning to the simple phrase any learner, anywhere, any time helped enable evaluation of relevancy and value for resources.

Planning sessions involved using facilitation activities based on liberating structures (Lipmanonowicz & McCandless, 2013) to ensure equity in voices and to invite innovation in thinking. The exercise Critical Uncertainties identified human touch as paramount. One exercise looking at what future learners would need and value across various age ranges demonstrated shifting focus and highlighted upskilling and reskilling as important points within larger demographic groups. Along this process, relevant newly released reports supported the emerging directions (Muscanell & Gay, 2025; World Economic Forum, 2025).

With human touch emerging as a cornerstone idea and consideration outlined in Pedagogies of Kindness (Grant & Pittaway, 2025; Denial, 2024) suggest providing learner agency through flexible options and personalized pathways as key to any resulting framework. These align with the core values of Universal Design for Learning or UDL (CAST, 2024). UDL is an approach which has become familiar in educational spaces and provides a common language for many educators to understand as well as resources to support their professional development building on this approach.

SUSTAINABLE DELIVERY FRAMEWORK

Core to this framework is seeking to centre the learner in an equitable way for all learners. As part of centring the learner is placing greater value on the knowledge the learner already has. It also includes supporting the educators to provide multiple modal access to learning to serve the learner in flexible ways (CAST, 2024; Johnson, 2023, 2024; Orr et al., 2018).

The Learning Framework (Figure 1) informed this framework with its four-pillar approach that recognizes support for learners and educators, builds on a sense of community, and brings a place-based perspective with direction towards the future of post-secondary education.



Figure 2. Learning Framework Graphic

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This framework emerged through exploring many different lenses balancing economic perspectives, learner voices, educator concerns, emerging technologies and industry demands, while also remaining true as a community college to serve the public.

Sustainable delivery framework (SDF) illustrated in Figure 2 is based on four key areas for change and development within higher education. These areas include: 1) validation or recognition of learners' background, academic and other experiences such as work, volunteer, and self-directed; 2) learner navigation supporting the learner in various ways outside the classroom; 3) educators – providing multimodal delivery in discrete learning units along with the supports to achieve this and 4) shifting the focus from entry level learning to lifelong learning. Woven throughout the intentions are the underpinning values serving common goals to enable equality, social justice, ethics, and human rights. Making education accessible to all includes consideration to all barriers including those of financial constraint. This framework seeks to make education open for all learners building on open resources and open pedagogy to increase access and empower learners.

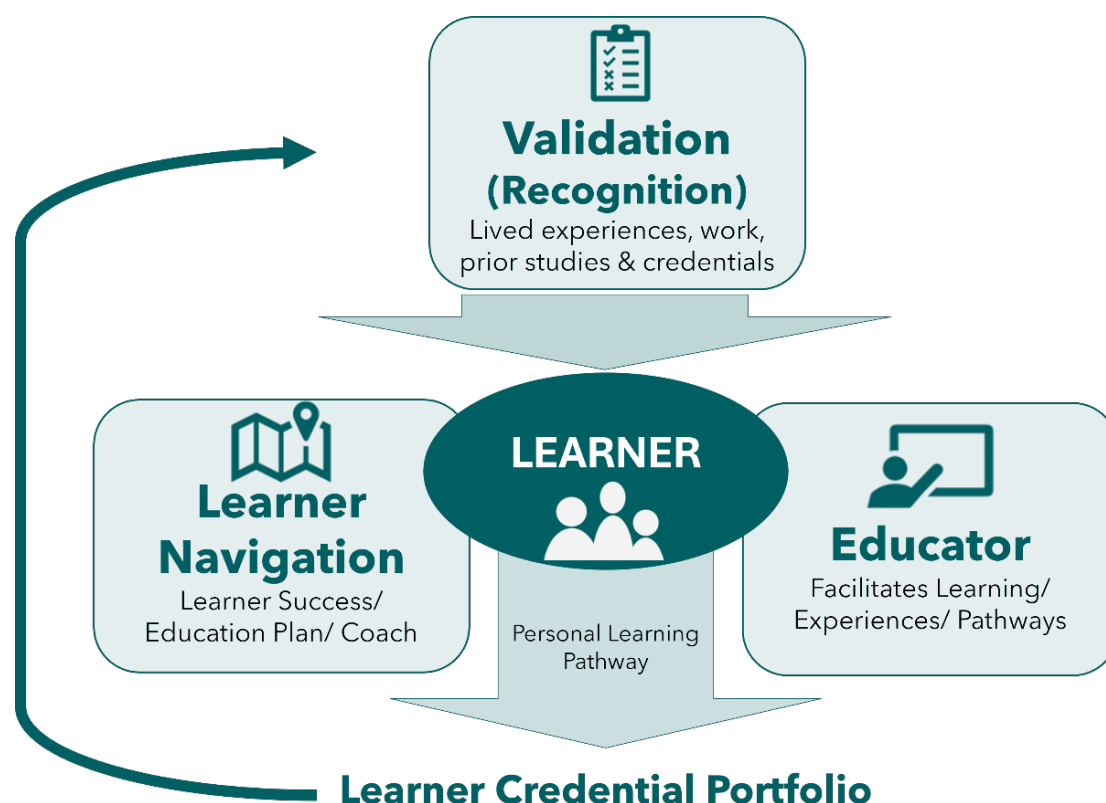


Figure 2 Sustainable Delivery Framework Graphical Representation

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The first aspect addresses the validation and recognition of learners' backgrounds and existing knowledge, aiming to integrate these into a learner credential framework. This includes the integration of systems to capture for learners' various activities and skills development they have undertaken and include demonstrated skills through employment. These are to be included in the learner credential portfolio. The intention of this area is to develop and shift to realize and recognize the skills learners have at all stages of life. This also means learners can tailor their learning path to include only what they need enabling learners to build up their personal learning credential framework.

The second area is the development of a learner navigation component. This component is seen to be a combination of AI, data and humans that serve the learners to provide a single point of contact for services beyond the classroom. The intention is pulling together all the key learner focused supports such as student success centre, registration, counselling, financial aid to work as a single spot for learners to reach out to. This is also seen to be the integration of various systems and data to provide a completely personalized experience that minimizes the challenges to navigate between various units – such as the student records, learning management systems, library patron systems, academic scheduling, learner credential portfolio and others. In this integration, the systems can become more scalable and sustainable reducing the duplication of both supports to administer and breadth of skills for staff to use such integrated tools. This is seen to go beyond the learner-initiated contact using additional tools such as learning analytics to identify “learners in need” to support learners before they get discouraged and quit. Learner navigation is to ensure learners are supported proactively, rather than solely relying on learners' ability to self-identify and reach out to services as needed. It also builds in a personalized "human" touch at all points of the learner journey. This learner navigation component

pulls on the power of technology along with the relationship of human touch to wrap around the learners to support them towards high achieving goals. This role of learner navigation continues after the completion of a credential. Maintaining contact and inviting learners to continue towards a lifelong journey balancing upskilling and reskilling and new skilling as necessary in their career path is also encompassed within this role along with invitations to participate as informed community members.

The third area of in this framework is the educator and the supports required to enable the educator to provide quality learning environments in discrete learning units. These discrete learning units enable learners to achieve their credential goals in a fashion that reflects their prior understanding and competencies. Educators will be adapting their approach to enhance what the learners bring. These discrete learning units can also be designed in ways that are customizable to emergent workplace needs. This is seen to be a multimodal delivery and is about creating a flexible learning environment meeting the learners where they are at. A learner who has come to the educational facility with a well-rounded broad scope of experience is granted recognition of that knowledge and those competencies has this recognition authorized and stored within the learner credential portfolio. It is envisioned this process of validation and recognition be augmented and supported by the power and capacity of large language models to review program, course and discrete learning unit competencies and align them with individuals present understanding, competencies, and background. This approach also enables sustainability with the opportunity to adapt in these rapidly changing times to reflect changing demands in skills and competencies.

The last component is based on the idea of lifelong learning. With the rate of change in technology according to the Future of Jobs report (World Economic Forum, 2025), 92 % of workers are expected to upskill or reskill in the next five years to meet the needs of industry, in particular building on artificial intelligence, and knowing how to use these tools. The tools and approaches afforded to us through the rapid technology enhancement drive need an expectation for continuous learning. The idea and concept of lifelong learning is also informed by the recognition that in the population forecast ages 25 to 54 is the greatest area of growth (BC Stats, n.d.). By targeting educational opportunities to this demographic, the College can expand their student draw interest and support expanding the enrolment and reducing the dependency on one student demographic group. This supports the viability of the College expanding the opportunities for learners to attend college. Creative approaches to bring intergenerational learning in the class composition expand these opportunities further. Imagine the depth of learning in a space with grandparents, parents and older children collaborate on real-world problems. Underlying SDF is value of education towards fostering equality, developing ethical understanding and facilitating social justice. In the workplace and market, there is an increasing gap in skilled workers along with significant technological change underway (World Economic Forum, 2025). These evolving technological changes drive a new approach for reskilling and upskilling and a new market opportunity.

Validation / Recognition = Learner Credential Portfolio

By allowing learners credit for their existing knowledge and experiences, education can become more affordable as they only need to take up topics they are not familiar with. Making a shift to competency based also welcomes learners to pursue education for curiosity – which has benefits in deeper engagement and broader co creation of ideas. This in turn also supports longer benefits for the communities. It enables the opportunity to attract diverse learners extending the market reach of the college, increasing learner populations in previous underrepresented areas.

Emerging efforts are making inroads towards broader credential recognition though actions such as adapting all trades programming to align with credit hours as a recognized unit of measure in the higher education sector for transferability. Resources needed include program and course level learning outcomes to align with competencies – using large language models (LLM) to build this is one of the new opportunities afforded with LLM. This also fosters strong integration between systems enabling data consumption between systems in other ways

Meeting learners where they are at and recognizing the skills, knowledge and competency they already have. This recognition of competencies welcomes different ways of knowing and invites our diverse learners including local Indigenous nations to the learning environment. This new process is understood to be built on the effective program mapping process where clarity in outcomes become better understood across all levels of the college. Having such data will enable tools to align experience and background with defined competencies. Such alignment allows the learning outcomes to be clear and serve to help inform LLM to build up the next steps.

The validation/recognition of learners' competencies and recording these in a learner credential portfolio attract diverse learners interested in some learning but not starting over. This configuration is part of the shift for the institution towards fostering lifelong learning opportunities and is part of the cycle of returning learners perceiving the college as their source for upskilling and reskilling. Efforts throughout the learning environment should ensure a focus on fostering curiosity for learning at all levels. This also contributes to increasing the enrolment and supporting returning alumni for additional learning opportunities and is seen as an opportunity to ensure the college continues to also engage in community partnerships. These alumni are also business owners, industry liaisons and valuable sources to identifying ongoing needs that college can serve to fill. Maintaining these relationships also supports the sustainability of the college in the longer term.

Learners

Implementing an educational delivery model that prioritizes the learner over the institution comes with several opportunities and challenges. Shifting to a learner-centred model requires significant investment in technology, training, and infrastructure at a time when resources are lean. It challenges both educators and administrators to change traditional methods and practices and requires a commitment to robust planning and continuous adaptation. Furthermore, ensuring the model can be scaled effectively to accommodate diverse learner populations and varying educational needs is complex. However, this shift is fundamental to tailoring learning paths, ensuring the credibility of credentials and addressing disparities in the education gap. The potential benefits of increased engagement, access, and institutional reach because of putting the learner at the centre make it a worthwhile endeavour both financially and ethically. To achieve this viable solution, it means changing and altering the various systems to integrate to enable seamless exchange of data between functions such as the scheduling of classrooms with the registration of learners, while also exchanging between program requirements and learner records. With this integration it opens the ability to support learners at all stages of their progression.

Effective technology enhanced learning relies on strong instructional design, which should be a strategic priority rather than a mere support function, helping educators to teach effectively and confidently to deliver in multi modalities. Within the framework proposed, continuous opportunity

and support for the educators remains important for successful transformation to meeting learners where they are at.

Equally important is recognition that learners are unique in their backgrounds, ways of knowing and goals. SDF is premised on the idea of success for all learners. Aligning the learning environments with OC Indigenous Strategic Framework (Okanagan College, 2025) encourages learning include reciprocity with each other and with the land building strong relationships. This is also captured in the Learning Framework (figure 1) with learning informed by place pillar.

In this framework, learners are invited to be repeat customers returning for lifelong learning opportunities. The evolution of stackable credentials is emerging as an important lifelong opportunity given the rate of change due to technological shifts. This is seen as an opportunity to continually build programs to upskill and reskill targeting the demographic of 25-54 olds—the largest growing demographic in the area. Lifelong learning becomes the drive. This also serves to support the sustainability of the organization to be place based, integrated with community and looking to the future. These alumni become part of the college planning with the intersectionality of their role as community members, business owners, returning learners, and parents of new learners. If they experience value from the college in these multiple roles, it serves to enhance the value of the college to the community in a reciprocal way.

Learner Navigation

Learner Navigation component is envisioned to provide as personalized single point for learners to be supported. This is anticipated to be a combination of AI, data and human providing learner support. This element will continue to evolve seeking to understand learner activity, knowledge, and goals to identify learning opportunities for learners.

Conference Board of Canada (2025) identified there is mismatch in Canada's skilled worker labour supply and demand, with two-thirds of the 80% of vacant positions require non-university credentials such as college and trades certifications. This is an opportunity for the college. Improving graduation rates and employment outcomes through targeted and expanded student supports would support both learners and communities. These supports would be enabled through the learner navigation function. The initial cost is higher to invest in and build systems capable of connecting resources and people, yet the anticipated payback will be in the improved retention of learners. Utilizing AI will drive human costs down while creating heavily tailored, scalable, learner experience. Human energy is only spent on high value interventions and engagements. Townsend et al. (2023) provide an example of success using AI to support triaging in emergency room situations with a parallel to the need of using this approach to triage in areas for learners such as counselling triage, financial triage bot. As the AI technology continues to develop, these opportunities are expanding with possibilities as this planning is happening.

Consideration of learner needs and intersectionality towards which learner services are necessary. For example, think of a mature visually challenged Indigenous learner returning to education feeling overwhelmed with financial needs – supporting them with one connection point would mean they would not have to navigate their own way. This specific example would likely include adult upgrading, accessibility, indigenous student services, financial aid, counselling services and possibly learning strategists. Adopting this approach of unified services supports the learners to feel valued and improve retention through a humanistic touch. These mentioned units exist presently but function

independently of each other. It is envisioned that a form of chatbot would support the collaborative nature. This new role would appear to exist as one outward facing interaction for learners. This integrated function works to help learners to find the right path – so for the learners to be guided to the delivery they require. For example, some learners should not be doing the asynchronous versus supported directed learning – some need that structure and interaction. Where the learners come from impacts the needs. For one example new learners like the “fresh to higher education” versus mature students have different needs and skills to be able to understand the relationships between peers for learning opportunities. RBC (2025) recommends investing in graduate success through enhanced student supports aligning with the learning navigation function within this model. Better experience improves retention and reputation, elevating the focus on relationships and being responsive to learner needs as a priority. This approach entails linking systems and cohesive data structures which results in the ability to scale due to the connections between systems and reduce redundant actions. Wrapping resources to support the learner remains the core function of the learner navigation component.

Educators

The framework identified element of “educators” is looking to illustrate the importance to the whole process to put the educators as key. With the scope of this transition moving from the traditional higher education delivery to a flexible delivery with a focus on competency based delivered in discrete learning units, this is seen as a bold opportunity. To achieve this, the human aspect of educator needs remains important. As this requires a shift in organizational thinking, this begins with a nimble core interdisciplinary team to work on designated projects to move the organization forward. As successes are achieved, the process of moving from course-based programming to learning outcomes/competency-based learning starts with small changes and progresses to changing unit of analysis in education progression to help support the sustainable element along with empowering an adaptable learning approach.

As educators are important elements towards the change, it remains key to ensure the educators are supported and equipped with the skills to build connections. These connections between learners, with educators and with the content are important to sustaining relationships in the learning space. Building and maintaining a dynamic culture supporting continuous growth of skills in educators is seen as a strong component for the success of this framework. A piece of the impact to educator story is that it is not just about having educator shift to teaching in a multi-access environment. The larger jump will be two-fold. First, by changing the level of analysis to a competency level learning model, educators will have to adapt how they teach entirely - even if they never teach through a digital means. When the unit of analysis changes, the link between those units of analysis changes. In a course-based environment, educators may or may not acknowledge the link between the course they are teaching and ones that follow (pre-requisites) or are unrelated (anti-requisites). When teaching at a competency level the network of connections between competencies becomes much more intertwined. It would become increasingly difficult for educators to not acknowledge the connectivity between competencies as the entire learner journey is based on the concept of being able to link competencies.

The timing, however, may be fitting that educators need to make a change with the meteoric rise of GenAI based content. More specifically, as information becomes even more democratized, the value proposition shifts away from being purveyors of information toward creating an interpersonal application-based learning experience (regardless of modality). As this learning experience is quite

different than the traditional didactic sage on stage approach, educators will need support to shift how they teach in an environment in which the learner has effectively unfettered access to curated content.

Realizing the shift will need to celebrate existing educators adopting multi access modes to illustrate the possibilities and to have resources at the ready to support those without strong digital skills – events like Pedagogies of Digital Delivery (modelled on Digital Pedagogy Lab concept) to help educators see themselves with options and create opportunities to explore new technologies. Ensure robust infrastructure to support this work along with training and educational technology support. As educators are key to skills learners develop, it is part of an effective plan to develop and expand the digital skills in the educators to ensure they bring the digital opportunities for learners to the learning environment. The idea of the educators being technologically proficient is reflected in the Student and Technology report (Muscanell & Gay, 2025) instilling increased learner satisfaction and confidence in their educational experience. This in turn has a benefit of happy alumni who are more likely to return and to recommend which improves the enrolment opportunities for the institutions.

Educator Supports. As the organization shifts towards this new framework, the educators need support to enable the success of this shift. These areas of potential gap include digital literacy, AI literacy, familiarity with multi-mode access and the development of clear learning outcomes/competency-based delivery. This shift forms the traditional focus on knowledge transfer and context in a standard semester becomes upended. Assessing competency includes thinking differently. Shifting to discrete learning units and stronger facilitation role versus knowledge transfer role facilitates re-education of roles as a part of shifting the approach. This requires fostering culture of lifelong learning and roles of educator and learners being exchanged. It includes transforming through using learning science to the recognition learning happens throughout the relationships. Investing in resources to provide better support the new idea of just what is needed learning opportunities. Skills development for educators to bring approaches to fostering greater learner agency will be part of opportunities as personalized learning pathways are paramount to this new direction.

Delivery Modes. Consulting with themes emerging from student feedback captured in local, national and international reports (Educause, 2025; Hutchinson & Clements, 2019; Johnson, 2024; Okanagan College 2023a, 2023b, 2023c; Shiohira, 2021), providing flexibility to meet learners where they are at appears to be the strongest take away. Shifting from the course-based delivery in limited modalities to multimodal delivery supports resilience and risk mitigation for the institution by reducing the dependency on either a single learner demographic or delivery model. This also helps to stabilize the revenue and enables resiliency to crises like pandemics or natural disasters. Another value to this is the opportunity to allow educators to teach across the modalities, expanding the teaching capacity without increases in costs. This design approach provides scalability to respond to fluctuating demands.

Community campuses are important to the college, but their enrolment challenges impact sustainability. One solution to this is building upon technology enhanced learning to offer multimodal delivery. This serves to meet learners where they are and enables flexibility. As community is one of the key learning framework points (Figure 1), working within community to meet learning needs involves educators connecting within the community. This work involves building relationships and ensuring educators have both background history and the necessary understanding to support learners with different ways of knowing. This is particularly important for our Indigenous communities. Maintaining both learning and supports for educators to indigenize learning remains a core value. With

better understanding of learner needs, educators can enable greater strategies to support all learners. More learners can be reached with the same instructor enabling efficiency in costs, scalability to offer more courses to broader learner catchment while maintaining the viability of community campuses to be learning hubs serving their local area.

As higher education enters new opportunities with tools supported by AI – this enables the discrete learning units in bite size learning to support delivering only what learners need. These tools support educators to identify what gaps exist for learners and support the educators to develop solutions that adapt to learner needs. These resources can support testing learner knowledge and iterating the scope of content along with the thoughtful design and input of educators. It is anticipated that there will be an increased resource utilization in terms of maximizing the infrastructure – reducing demand on the physical facilities while also keeping them in use. Some cost of lab spaces and materials are being offset by the cost of Virtual Reality. Adapting to multimodal delivery can enhance the efficiency of educator deployment as educators can teach across modalities increasing educating capacity without proportional increases in educator costs. Through this effective utilization of digital means to enable experience, both economic and human costs are reduced.

Discrete Learning Units. Shifting delivery from course-based programming to learning outcomes/competency-based learning – and changing unit of analysis in education progression to help support the sustainable element along with empowering an adaptable learning approach. This change enables clarity towards validation and recognition for prior learner work, studies and knowledge which supports the Learner Credential Portfolio, while allowing learners to streamline and personalize their learning experiences to be targeted what they require. This enables bite sized learning opportunities and can reduce the redundancy of course work for learners who have part of the competencies previously defined through an entire course. Enabling learners to identify their gaps and select learning to deliver only what is needed helps maintain their interest and engagement. It also is seen to enable broader opportunity to serve industry towards supporting their learning needs as identified.

Progression will be to start with programming using a consistent approach and capture of information. As this is a significant shift for delivery, this will be a transition that impacts many facets of education including the scheduling, traditional credentialing and records along with the variable classroom composition. Quality assurance measures will also be important to establish at the start to ensure learners are appropriately placed.

IMPLEMENTATION PLAN

Many of the elements identified by the key elements of SDF can be integrated. The idea of clear learning outcomes involves an institutional review of program mapping in all programs to ensure competencies are clearly defined for all learners. This step creates the data necessary for the Validation/Recognition element and will enable better design for the Discrete Learning Units for educators and the supporting units. It also enables supporting the Educators to clearly align assessment approaches to the expected outcomes.

Activities with intentionality to improve opportunities and support for Educators towards digital literacy are happening. Development of new learning opportunities for educators to be extensive, relevant and expanding are underway. All of this foundational work is preparing the culture for the transformation. Programming is being reviewed with the intention of flexibility in delivery with a few

key projects to pilot new directions and flexible modalities scheduled in the coming academic year. Ongoing evaluation of these projects informs the next iteration of this work.

Short-Term Steps

Throughout the college projects underway are moving towards a new direction defined under our larger strategic vision. These projects support this framework as short term steps necessary to position the college to undertake the transformation necessary. This foundation moves to the next step of integration to all processes to shape a common vision and approach. Some of the data required includes:

- Mapping programs – building learning outcomes and competencies to serve as data for validation/recognition and towards developing discrete learning units. This also includes
- Ensure data integrity and quality assurance for credentialing to be used as another source for all systems to create program vitality reports to ensure responsive learning serving learners of today and the future.
- Investing in educator events and support to enable exploration in new approaches – showcasing pilots. These transformational opportunities seed ideas of opportunity for other educators and move the transition to new ways for multimodal delivery.
- Student tutorbot for answering questions – this starting point for the integration of AI will provide important information for the development of the larger inclusive Learner Navigation role and aspect of this framework.
- Evaluation of what learning analytics are necessary to inform and shape new directions to evolve the Learning Management System (LMS) to capture the right data. This data can be used in Learner Navigation to identify and intervene for those learners at risk. This data also informs what works and what needs work for the educators.

One project completed in the past year evaluated how programs are developed, renewed and possibly retired in a cycle reflecting maintaining program vitality. Another one defined the learning framework to provide the foundational values for the college to define learning environments. All of these provide foundational elements for the subsequent steps.

Longer term projects

There are several aspects of development seen for the future to support this frameworks evolution and adoption. These include:

- Building the LMS to be responsive and to capture those learning analytics has started in a limited manner. In the coming years this will increasingly expand to capture expanding information.
- Information Technology (IT) systems integrate artificial intelligence in aspects throughout the college as well as integrate the data elements needed at various stages of learner progression.
- Quality Assurance is to be considered within all elements and stages. As rapid growth in technology enabled tools continues, it remains key to success to ensure quality assurance checks are built in through all facets of learning offerings including those for educators.
- Various units focused on supporting learners will be assigned to developing solutions that work within their units but also mitigate learner confusion. Developing communication

and tracking approaches while still maintaining learner privacy will be part of the implementation hurdles to overcome.

CONCLUSION

This Sustainable Delivery Framework plan is being developed to address the current issues of learner retention, dynamic needs and financial constraints facing the college. The value in this framework is shifting from a traditional model of education providing learning for entry level learners and expanding to providing lifelong learning opportunities. This shift also changes the role of educators from imparting knowledge to facilitating learning in these dynamic times where learners need digital skills for technologies yet to arrive. Becoming the hub for learning in the community brings industry together and serves to recognize the place and to look to the future.

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All authors have read and agreed to the published version of the manuscript.

Sustainable Development Goals

This innovative practice links to the following SDG(s): Quality Education (SDG 4), Gender equality (SDG 5), Decent work and economic growth (SDG 8), Industry, innovation and infrastructure (SDG9), Reduced inequalities (SDG 10), and Peace, justice, and strong institutions (SDG16).

Authors' Notes

Generative AI was not used in the creation of this framework.

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Additional resources reviewed during the project can be found through the digital resource list provided by the College Library: <https://rl.ca.talis.com/3/okanagan/lists/D7C3178C-E891-29B6-6482-0D57B97A462A.html?lang=en-CA>

Exchanging Ideas for Inclusive, Scalable and Sustainable Education

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ABSTRACT

Extending lifelong learning opportunity to the wider community: the University of Hong Kong School of Professional and Continuing Education (HKU SPACE) is presented as a case study in aiming to achieve inclusivity, scalability and sustainability.

HKU SPACE is the self-financed extension arm of the University of Hong Kong and operates at *scale* with an annual enrolment of over 60,000 students - 12,000 full time, 50,000 part time. It is financially *resilient and sustainable*. Face to Face (F2F) provision is popular in HK, there is also extensive online provision (especially during and post-covid) and Transnational Education (TNE) opportunity. The Hong Kong (HK) government supports 8 publicly funded universities and there are 25 self-financed tertiary providers plus many private companies / TNE providers. HK is promoted as an international education hub. The scale of provision will be explained.

The public universities are elitist, the self-financed sector is more *inclusive*; both attract Mainland students (subject to quotas); HKU SPACE promotes lifelong learning to the wider community, including non-Chinese speakers and also TNE opportunities. The competitive environment promotes responsiveness to market demand and flexibility - constant *innovation* - such as microcredentials. Government also promotes integration with the Greater Bay Area (GBA) which embraces a population of over 85m.

Success in the sector also depends on quality provision and HKU SPACE competes on *quality* not cost. It has a network of physical centres across HK, close to the transport networks and offers access points at all academic levels from foundation to postgraduate presenting ladders of opportunity for *openness*.

Keywords:

lifelong learning; transnational education; inclusivity; blended learning; scalability; sustainability; resilience

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AIMS AND OBJECTIVES

The aim of this paper, using the University of Hong Kong School of Professional and Continuing Education (HKU SPACE) as a case study, is to share an example in Hong Kong of inclusive, scalable and sustainable continuing education and lifelong learning.

CONTEXT

The University of Hong Kong (HKU) itself was founded in 1911 and is a highly ranked research and teaching institution Quacquarelli Symonds (QS) 2026 ranking of 11, Times Higher Education, 2025 ranking of 35). HKU is a publicly funded university, one of 8 in Hong Kong overseen by the University Grants Committee of Hong Kong (UGC) which is the conduit for government funding. UGC oversees the quality of provision via its Quality Assurance Council (QAC) which performs five yearly institutional audits of the 8 public universities. UGC also distributes research funding via its Research Grants Council (RGC) of which HKU is usually the largest recipient. In addition, UGC sets the permitted student numbers for first year, first degree places and for funded taught Masters (most taught Masters are self-funded and their numbers are not controlled).

HKU SPACE began as a Department of Extra Mural Studies (DEMS) in 1957, becoming a School in 1992 and a University Company Limited by guarantee in 1999. HKU SPACE offers certificates and diplomas of the University but not degrees which are only offered through the 10 Faculties and HKU SPACE is independent of the Faculties. The certificates and diplomas offered via HKU SPACE are at all levels from Foundation to Postgraduate and vary in size from small for credit modules to large programmes offered over a longer period, up to 3 years in some cases.

The original remit of DEMS/ HKU SPACE was to provide continuing education courses for adults, largely on a part-time basis with classes in the evenings and weekends. The courses offered had to meet their costs and a small number of academic posts were supported by the university over the years. Enrolments grew modestly, 330 in 1957, reaching 4,200 by 1970 and 20,000 by 1980. The decade of the 1980s showed rapid change as the Hong Kong economy transformed from manufacturing to services bringing with it a demand for re-skilling, particularly, for degree courses on a part-time basis which intensified towards the end of the decade. This demand was largely met by courses from overseas universities. By 1990 enrollments were 39,000, reaching 95,000 in the year 2000 as opportunities for overseas degrees in particular grew as did those for feeder programmes to such degrees.

Transnational Education (TNE) in Hong Kong

In fact, HKU SPACE had a long history of working with overseas universities to provide degree study opportunities. Notably, with the University of London external system for the LLB degree from the early 1960s and a Higher Certificate in Biomedical Science with the then Napier College of Technology (now Edinburgh Napier University) from the early 1970s. The HKU SPACE experience of the London LLB programme led to the establishment of the Department, now Faculty, of Law at HKU in 1969. The Napier programme, for the training of medical laboratory technicians, was initially supported by the

UGC. Both these partnerships continue and have been supplemented with extensive TransNational Education (TNE) opportunities offered in Hong Kong by HKU SPACE. Across Hong Kong these grew rapidly during the 1990s reaching a peak around 50,000 students by the turn of the century but have declined since to around 20,000. Nevertheless, this TNE provision served a purpose during the 1990s to absorb demand for degree level study in Hong Kong as places were not otherwise available in the local system. A combination of factors in the 2000s led to a decline in TNE numbers. Reasons for this included more self-financed post-secondary and degree places available locally and a declining School leaving population.

The impact of TNE on HKU SPACE has been significant. As a principally face to face (F2F) teaching operation, it has nevertheless been necessary to support students in effectively a distance learning mode in both the London and Napier collaborations from an early date as well as in the greatly expanded provision from the 1990s. Currently HKU SPACE collaborates with 20 overseas institutions to offer their programmes in Hong Kong - some 90 programmes in total and a student headcount in 2024 of 3,200 (some 16% of provision). In addition, there are at least 30 other institutions with whom HKU SPACE has collaborated with over the past 35 years, but whose programmes are no longer offered for various reasons. Historically many collaborations were one programme with one institution, but policy now is for strategic partnerships involving fewer partners with whom there are multiple programmes. Currently there are 8 such strategic partners.

These overseas links – TNE – have therefore given HKU SPACE extensive distance learning operations. At first the support to learners was face to face, albeit provided by HKU SPACE at a distance from the awarding institutions, or involving fly-in faculty and certainly involving paper-based learning materials which later, of course, moved online. Whilst these overseas links form part of the HKU SPACE hybrid or dual mode institution role, there is also extensive online provision in the School's mainstream operations.

E-Learning in HKU SPACE

This is reflected in the introduction of the SOUL platform (SPACE Online Universal Learning) from the early 2000s and which is now in version SOUL 3.0. This provides support to learners such as learning materials, submission of assignments, online library access, communication with teachers and fellow students etc.

The School's e-learning policy is outlined in its Blended Learning Guidelines. This mandates that all award-bearing courses should contain some e- learning elements. There are few that are completely on-line but a number of overseas partnership programmes are now mostly online with local face to face support. HKU SPACE has also developed a number of MOOCS (Massive Open Online Courses) with FutureLearn. These are:

- Buddhism: Diamond Sutra and World Peace
- Buddhism: Diamond Sutra and Zen Meditation
- Chinese Medicine: Treatise on Febrile Diseases Caused by Cold
- Integrative Pain Management - Chinese Medicine and Western Medicine
- Introduction to Aviation and Big Data Applications
- Postgraduate Certificate in Integrative Medicine (Pain Management) (award-bearing and with tuition fee)

For HKU SPACE itself, and for TNE generally, the Covid outbreak stimulated a greater development of online provision and clearly there would be no return to the pre-Covid situation after the pandemic. For one thing there was wider appreciation of the advantages of online delivery, including of learning materials but also of synchronous and asynchronous delivery. In addition, online material could also reduce F2F provision thus reducing costs of fly-in faculty visits.

The School's Blended Learning Policy recognises that e-learning is now widely used in education at all levels and is expected to expand. Moreover, e-learning and traditional face to face teaching and learning are not mutually exclusive, each has its strengths and in a compact geographical area such as Hong Kong with good transport links it is more effective to enhance access to blended learning to take advantage of the strengths of both modalities.

A blended learning policy was first enunciated in 2004 and has been regularly updated as well as part of the School's Strategic Plans.

The policy provides 3 levels of e-learning provision in award-bearing programmes:

1. Basic E-learning

Makes use of basic e-learning function, to disseminate course materials and information via the SOUL platform – announcements, calendar, course content sharing, resources sharing

2. Blended learning

In addition, makes use of the functions in SOUL for discussion forums, chatrooms, assignment submission and Turnitin, quizzes

3. Advanced E-learning

Building on the foregoing, additional elements include the design and delivery of online course contents, virtual reality content, augmented reality content, zoom/webinars/virtual conference activity, online courses, MOOCs and E-assessment

The policy also covers IP-rights and the use of the School's support from its IT Services Unit, E-Learning Team and the Maisy Ho Centre for Teaching and Learning Centre to provide training.

The aim is to promote usage by full time teachers, part time teachers and students. It goes without saying that the Covid outbreak stimulated greater usage and that this enhanced use of e-learning will be advanced further.

Overview of HKU SPACE

At its inception, in 1957, the then Vice Chancellor, Professor Lindsay Ride stated

Your Department [of Extra-Mural Studies], which was instituted by the Court yesterday, is the most important of all our departments as far as public relations are concerned. Planned aright and if given full scope, your work will touch every section of the community, every stratum of our society; it is the most important means of explaining or making available to the masses the knowledge accumulated by the few.

and this has been a guiding philosophy for the School, very much an inclusive approach. This is also referenced in the School's Vision Statement:

In fulfilling the commitment of The University of Hong Kong in developing and extending lifelong learning opportunities for the community, HKU SPACE aspires to be a world-class centre of excellence for the provision of professional and continuing education in Hong Kong and the region.

It should be emphasised in this context that the School is a University company limited by guarantee and that it is self-financed and not for profit. Up to the mid 1990's the School had a small number of academic posts provided by the University from public funds. Government decided at that time that continuing education should no longer receive any public funding and this was the principal reason for establishing the corporate structure for HKU SPACE so as to ring fence its operations from those of the University to ensure that it did not receive any financial support from the University and that it paid for all the University services that it consumed. The University Council appointed 6 Members as the ultimate controlling authority (the University itself represented by the Registrar, the President and Vice Chancellor, a Deputy or Pro Vice Chancellor, the University Director of Finance, the Chairman of the HKU SPACE Board of Directors and the HKU SPACE Director). This gives the University a clear majority as the 'significant controller' under Hong Kong Company Legislation.

The main task of the Members is to appoint the Board of Directors, a 15-strong body which acts as the main body overseeing the management of the School and whose members/ directors serve for 3-year terms. Again, the connection is that the University nominates 9 directors in total including the Chairman, with the HKU SPACE Director as a director and 5 independent directors from the wider community to include both the community perspective as well as individual expertise. The Board meets quarterly and receives an update from the Director between meetings.

In terms of award bearing programmes offered, these are approved by a Board of the Senate, the Board for Continuing and Professional Education and Lifelong Learning (CPELL) chaired by the Vice President and Pro Vice Chancellor (Teaching and Learning).

There are two major categories:

1. part-time award-bearing programmes for adults with classes in the evenings and/or weekends. There some 504 of these offered by the 3 part time Colleges – Business and Finance, Humanities and Law, Life Sciences and Technology
2. full time 2-year sub-degree programmes in the Community College for school leavers who have missed out on University entry, 75% of whom then complete a University degree locally (half in UGC funded universities). The awards conferred are Associate Degrees (more general) or Higher Diplomas (more vocationally focused). Some 40 award-bearing programmes are offered.

In terms of scale, 2024/25 saw some 11,000 full time students in the Community College as well as a further 3,000 students in a joint venture College with a local charity, Po Leung Kuk. There are then some 50,000 part time learners who equate to about 8,000 full time equivalents (FTEs) – a total of about 22,000 FTEs. Also included are some 320 full time students following TNE degrees.

To service this operation the School has around 900 staff, one third of whom are academic, either full time teachers (largely in the Community College), or full time Programme Leaders and Managers (largely in the 3 part time Colleges). A distinctive feature of teaching delivery is also the part time teacher force of some 2,300 teachers drawn from different industries and professions who deliver a wide range of expertise.

It will be evident from this scale of activity that HKU SPACE is an inclusive organisation. Students can enter at many levels and progress through ladders of opportunity to degree level and above. The size of the provision also demonstrates scalability of the operations while this also contributes to the sustainability of the operations in a competitive and self-financed environment.

The Wider Hong Kong Context of Post-Secondary Education

Reference has been made already to the 8 UGC-funded universities (plus a small, specialist institution, The Hong Kong Academy for Performing Arts (HKAPA)) which receive public funds, 5 of which are in the world top 100 in rankings and have a limited first year first degree entry of 15,000 students for local students in the context that the school leaving cohort, though in decline, is currently around 50,000 annually. Thus, there is scope for private (i.e. self-financed) universities and colleges to meet this demand. In fact, the Hong Kong government encouraged self-financed institutions to offer post-secondary programmes for these students so as to increase the provision for school leavers without having to pay for this. Initially, this was in the form of 2-year full time courses leading to Associate degrees or Higher Diplomas from the year 2000. Later, around 2012/13, the emphasis pivoted to encouraging self-financed degree provision by which time Hong Kong had moved from 3-year Bachelor degrees to 4-year degrees. The extent of this provision is as follows:

Table 1. Provision of degree places

Academic Year	2022/23
Publicly-funded first-year-first-degree places	15,170
Self-financing first-year-first-degree places	8,500
Total	23,670
Publicly-funded sub-degree places	11,100
Self-financing sub-degree places	19,100
Total	30,200

Most of the UGC-funded universities have established self-financing units such as HKU SPACE, which is the largest and longest established. There is the Hong Kong Metropolitan University (HKMU) (self-financing). There are also 11 institutions registered under the Post-Secondary Colleges Ordinance (Cap 320), some of which have become private universities. In addition, 9 institutions are registered under the Education Ordinance and offer full-time sub-degree programmes. Hong Kong also has a Vocational Training Council (VTC) which is government sub-vented and offers a wide range of programmes. It also has a self-financed arm, The Technological and Higher Education Institute of Hong Kong (THEi) which offers degree programmes including those of overseas institutions. There is also the Employees Retraining Board (ERB) which offers courses and commissions courses, particularly for the unemployed, from various providers. In addition, there are private companies offering courses and some overseas universities have their own offices. In addition to degrees many of these providers offer part-time continuing education courses. Thus, the environment is very competitive.

Some further statistics on the scale of activity are presented below: (from the Hong Kong Government Annual Digest of Statistics for 2024)

Table 2. Education Attainment %

	<u>2023</u>	<u>2013</u>
Primary or below	17%	20%
Secondary	48%	51%
Post-secondary non degree	9%	8%
Degree and above	27%	21%

This indicates that there should still be demand for continuing education/lifelong learning given that over 60% of the population have only secondary education qualifications or below. These figures are for 2023, those for 2013 show significant improvement over that decade. (Source: Census and Statistics Department, HK Government)

Table 3. Number of institutions offering post-secondary opportunities

UGC-funded universities (including self-financed arms)	8
HKAPA	1
HKMU	1
Institutions registered under Cap 320	11
VTC	1
Other post-secondary institutions	8
Miscellaneous	4
Schools offering tutorial, vocational and adult education courses	2,955

The miscellaneous category includes specialist institutions, such as the Hospital Authority (Nursing) and Prince Philip Dental Hospital (Dental Auxiliaries), the Continuing Industry and Clothing Industry Councils. The last category is not very helpful as it includes a vast majority of tutorial schools for children and does not distinguish those offering vocational and adult education which is likely a much smaller number – all have to be registered under the Education Ordinance where more than 6 participants are concerned.

Table 4. Student enrollment in the different categories (2023)

UGC-funded universities (including self-financed arms) – (a)	203,579
HKAPA	1,063
HKMU – (b)	21,871
Institutions registered under Cap 320	22,540

VTC	39,879
Other post-secondary institutions	7,587
Miscellaneous	1,552
Schools offering tutorial, vocational and adult education courses	280,838
Diploma of Applied Education – (c)	4,227
TransNational Education – (d)	19,700

To elaborate on these numbers:

- a) the UGC funded university numbers probably do not reflect fully the activities of their extension arms;
- b) the Hong Kong Metropolitan University was re-named from the Open University of Hong Kong in 2021. This reflects that it has pivoted to being a provider of full-time degrees rather than principally an open learning institution. It still does offer some distance learning programmes in Mainland China. It would now be more accurately described as a hybrid institution.
- c) The Diploma in Applied Education is offered by a number of member institutions of the Federation for Self-financing Tertiary Education (FSTE) which is an organisation open to institutions offering self-financed tertiary education, principally the extension arms of the UGC-funded universities, some Cap 320 institutions and some of the other post-secondary institutions. The course is aimed at those not passing the secondary school leaving examination (Hong Kong Diploma of Secondary Education, HKDSE) to allow them an opportunity to progress to post-secondary education if successful. About half those registering are full time school leavers and half are part time mature students.
- d) Hong Kong is a relatively open market for TNE – such courses have to be registered with the Education Bureau under the Non-local Higher and Professional Education (Regulation) Ordinance (Cap 493) which has 2 categories “Registered,” where there is a private operator involved and “Exempted,” where a UGC-funded university (including their extension arms) is involved in partnering with the overseas institution. The former category has to be evaluated by the HKCAAVQ (and hence is more costly) while the latter are evaluated by the Hong Kong partner university. The main criteria are that the overseas institution is recognised in its home jurisdiction and that the course offered is also offered in the home institution. There should also be adequate teaching and learning facilities. Of late, the Hong Kong Inland Revenue Department has deemed the earnings of overseas institutions in Hong Kong to be taxable and this may further reduce TNE numbers.

The foregoing therefore demonstrates something of the scale and variety of educational provision in Hong Kong, particularly in the self-financed sector which is very competitive.

Having said that there are some forms of support available from the Hong Kong government for some of the institutions in the self-financed sector. For example, students in Cap 320 institutions are eligible for 'student vouchers' worth some HK\$39,000 towards their fees while institutions currently under Cap 279 offering both degree and sub-degree programmes may be eligible for the Study Subsidy Scheme for Designated Professions/Sectors Scheme (SSSDP) which grants subsidies (currently up to

HK\$87,770 per academic year, HK\$87,770 for laboratory-based degree programmes; HK\$50,810 for non-laboratory-based degree programmes; HK\$39,890 for laboratory-based sub-degree programmes; HK\$22,910 per non-laboratory-based sub-degree programmes) to students in selected programmes but with an approved intake quota per programme. None of these subsidies apply to HKU SPACE as a self-financed arm of the University of Hong Kong. What is available periodically to the self-financed sector is the opportunity to bid for land grant sites and soft-loans repayable over 20 years to develop these. These opportunities are relatively rare. HKU SPACE was successful in one of these in 2004 which enabled development of its Kowloon East Campus, the headquarters of its Community College. Occasionally, also school sites are available, especially as the shrinking school age population leads to school closures, notably at primary level. Again, HKU SPACE has been able to develop one such site, Island South Pokfulam, which now functions mostly as a specialist centre to support various technical facilities for programmes such as Aviation, eSports, Geotechnical, Nutrition and Biomedical Science. Both these facilities are held on 10-year renewable leases from government and are subject to annual reporting against an Educational Development plan.

It may be observed in this context that HKU SPACE operates an extensive range of learning centre facilities across the territory and has done so for many years – "taking the University to the community". There are 10 major centres across Hong Kong as well as use of the main HKU campus. The School headquarters are in the Admiralty/ United Centre complex in the downtown area which also comprises several floors of learning facilities. There are two other centres on Hong Kong Island as well as the Island South Centre. In the mainland part of Hong Kong there are four centres in Kowloon Bay adjacent to the Kowloon East Centre, a Kowloon West Centre and a centre in Sheung Shui close to the border with Shenzhen in Mainland China. This extensive provision is some 70% owned or on government leases, and 30% commercially leased which can be expanded or contracted depending on demand.

The School is able to make relatively full use of the facilities because of its mix of full-time students in the daytime and part-time students in the evenings and weekends. Another factor in the use of space has been a move to hybrid working over the past two years (a 40% work from home policy) which has allowed savings to be made in space utilisation and costs. Thus, hybrid working is an additional element to HKU SPACE being a hybrid institution with both face to face and online/distance provision.

HKU SPACE SCALE OF PROVISION AND SOME INNOVATIONS

The HKU SPACE provision not only covers award-bearing programmes. There is a healthy provision of non-award-bearing courses or short courses. These may be

- a) for general interest or
- b) in the nature of executive programmes or
- c) commissioned courses from government or industry for their staff.

The most recent full year statistics (2023/24) are given in Table 5.

Table 5. Programme data (2023/24)

Level	No. of Programmes	No. of Students at each Academic Level	Course Enrolment Numbers	Full-time Equivalent (FTE)
Part-time Courses	76	2,175	6,425	732
Doctoral/Master's/PG				
Bachelor Degrees	34	1,933	8,299	966
Advanced Diploma/Diplomas	96	4,652	17,138	1,984
Certificates	298	13,638	#17,093	2,292
Professional/Executive	246	17,413	18,443	587
Personal Development	334	11,446	^15,961	1,592
Part-time Sub-total	1,084	51,257	83,359	8,153
Full-time Courses				
Community College				
Diploma in Foundation Studies	1	558	558	558
Associate Degrees	16	6,645	6,645	6,645
Higher Diplomas	22	1,439	1,439	1,439
HPSHCC Programmes	20	2,933	2,933	2,933
AD/HD Sub-total	59	11,575	11,575	11,575
International College				
Bachelor Degrees	17	360	360	360
Sub-total	17	360	360	360
School Total	1,160	63,192	95,294	20,088

Table notes: # including 4,253 enrolments under Microcredential programmes; ^ including 7,929 enrolments under Applied Learning programmes

The development of Microcredentials since 2023 is worth highlighting. These are short for credit courses (usually 6, 9 or 12 credits in the Hong Kong Qualifications Framework tariff where 120 credits represents a full-time year of study). Successful completion of a Microcredential results in the award of a digital certificate and these awards are stackable towards the award of a certificate (30 credits) or diploma (60 credits) with a validity of 5 years. In some cases, the credits may be stackable or recognised by overseas providers in their programmes.

In addition, most Microcredentials are also badged as a “Certificate for Module” and entered on the Hong Kong Qualifications Register (HKQR). This brings eligibility for the government’s Continuing Education Fund (CEF) which provides HK\$25,000 for learners to support their participation in eligible courses (must be on the HKQR and not more than 50% online). It is worth mentioning that HKU SPACE

offers some 1,800 CEF courses (as of 30 April 2025) which is almost 40% of the total provision and bigger than the next 6 providers combined.

In terms of the full-time provision, the HKU SPACE Community College provides some 33% of the total sub degree programmes on offer and, combined with the Joint Venture College, provides some 40% of the total. These figures are a proxy for the scale of the HKU SPACE operation in Hong Kong - 40% of both part time and full-time offerings.

The Applied Learning Programmes are designed for senior secondary school students under a government scheme to provide opportunities for those studying the Diploma in Secondary Education with opportunities for elective courses in addition to the core curriculum.

QUALITY ASSURANCE AND ENHANCEMENT

To underpin the scale of activity at HKU SPACE, it is vital that what is provided is of high quality and is seen to be of high quality. The HKU SPACE Quality Assurance and Enhancement system was inaugurated in 1999 with the help of an external consultant and has been periodically revised since then. It is elaborated in detail in a Quality Assurance and Enhancement Manual and summarised in a shorter Quality Assurance and Enhancement Handbook. The Quality Assurance and Enhancement (QAE) Unit comprises some 20 staff and a Quality Assurance and Enhancement Committee meets quarterly to review the system and receive regular reports from the Colleges. Each programme, or group of cognate programmes, has an Academic Committee to monitor programme delivery annually and reports to the Committee via the College Boards. These reports are consolidated for report to the Board for Continuing and Professional Education and Lifelong Learning, the Senate body responsible for HKU SPACE academic work. All these committees include members external to HKU SPACE and the quality of provision is an important element in external reviews of the School. For example, the UGC's Quality Assurance Council includes HKU SPACE in its regular audits of the University and HKU SPACE also underwent an International Quality Review which found that the School meets all 10 European Standards for Quality.

An important development in recent years has been the establishment of a Quality Analytics Team within the QAE Unit to analyse the School's quality data in meaningful ways to contribute to the understanding of and improvement to the various aspects of provision.

Hong Kong and the Greater Bay Area (GBA)

The GBA is a geographic area comprising the Pearl River Valley and Delta and containing major cities such as Guangzhou, Shenzhen, Dongguan, Zhuhai, Zhongshan, and Foshan as well as Macao and Hong Kong.

It is also an economic concept of the national government to promote greater cooperation and development amongst the constituent cities. In all it comprises a population of some 86 million compared to Hong Kong's 8 million. Clearly, providing educational opportunity in the GBA widens the scope of Hong Kong institutions notwithstanding existing provision by Mainland Chinese institutions. Most of the 8 publicly funded institutions have established campuses in the GBA. The University of Hong Kong via its Medical Faculty operates a hospital in Shenzhen, while the Faculty of Business and Economics and its Institute for China Business offer programmes. HKU SPACE hopes to be able to offer sub-degrees in the GBA in addition to an eDFS (Diploma in Foundation Studies (E-learning Mode)) which commenced in 2024/25 with a small intake. Those completing a sub-degree in the GBA or

elsewhere in Mainland China (HKU SPACE also has an arrangement with Northwestern Polytechnical University to offer the eDFS in Taicing near Shanghai) would probably seek to further their studies to complete degrees in Hong Kong. This may also offer opportunity to Transnational Education (TNE) programmes in Hong Kong should the Ministry of Education recognise such progression routes as it does elsewhere (e.g. in Singapore).

Transnational Education (TNE) and International Benchmarking

One aspect of TNE provision is the commitment of overseas partner institutions to quality provision and their expectation that Hong Kong partner institutions meet their standards. Increasingly, the UK Office for Students (OfS) also lays down expected quality standards. Many of the HKU SPACE TNE partners carry out reviews of the operations of their programmes in Hong Kong and, for example, HKU SPACE is a recognised Teaching Centre of the University of London. In addition, a number of TNE programmes offered via HKU SPACE have undergone accreditation by HKCAAVQ and thus appear on the Hong Kong Qualifications Register.

In its Vision Statement, HKU SPACE states that it "aspires to be a world class centre of excellence for the provision of professional and continuing education in Hong Kong and the region." As mentioned, the International Quality Review and UGC QAC Audits play a part in assuring this as do the University's own reviews and HKCAAVQ accreditation of some non-local courses. The School also uses the service of Etio (formerly i-graduate) which operates the student barometer with some 300 universities participating worldwide in a survey of student responses. HKU SPACE scores well in this comparative exercise. The School is also an International Associate Member of the Quality Assurance Agency for Higher Education (QAA) in United Kingdom which provides significant materials on quality developments worldwide. It is also a Member of the University Professional and Continuing Education Association (UPCEA) in United States and regularly attends its conferences as well as those of the Australian International Education Conference (AIEC), British Council, Asian Association of Open Universities (AAOU) and the International Council for Open and Distance Education (ICDE) to keep in touch with relevant developments so as to benchmark internationally.

REFORM OF LEGISLATION ON POST-SECONDARY EDUCATION IN HONG KONG

Finally, this paper should conclude with a reference to a major change in the legislation that oversees the provision of self-financed post-secondary education in Hong Kong, the Post Secondary Colleges Ordinance, Cap 320. The legislation was first introduced in 1960 and by 2018 was identified as in need of reform given the development of the self-financed sector and a much-changed landscape (The Task Force on Review of Self-financing Post-secondary Education Review Report in 2018).

Essentially there were 11 institutions under Cap 320 offering four-year full-time degrees, a number of which were or became universities. Then there were 7 institutions registered under the Education Ordinance (Cap 279), offering two-year full time, self-financed sub-degree and the self-financed extension arms of the UGC funded universities which also offered two-year full time, self-financed sub-degrees. The two-year sub-degrees were a response to the government's call in 1999 to expand provision for school leavers to access post-secondary education (but not to pay for it) and later, around 2010-12 this pivoted to a call for four-year degree provision under the Cap 320 institutions.

There was a perception also from the Cap 320 institutions whose programmes were accredited by HKCAAVQ that the University extension units were advantaged by a more flexible system and hence there were calls for a "level playing field". In the 7 years from 2018 to enactment of the reformed Cap 320 in June 2025 it may be that this perception has changed since the extension arms (such as HKU SPACE) have established a significant market share of sub-degree provision, while those which offer degrees benefit from their association with their parent universities, especially as 5 of them are in the world top 100 in rankings. Nevertheless, the government wishes to regulate the sector more directly, albeit it is a self-financing one, especially as there are a number of small institutions which may be a target for rationalisation. The Hong Kong government has a policy to be an international education hub and may see larger institutions as more viable in this context.

The new regime means the existing 11 institutions under Cap 320 will be joined by 7 from Cap 279 - and their migration will be mandatory. For the 5-6 extension arms of UGC funded universities it had been assumed that their migration was also mandatory but it was revealed in the Bills Committee stage in May 2025 that this would in fact not be compulsory. HKU SPACE is therefore evaluating whether or not it is in its interest to migrate or whether, in fact, there is a case to retain the status quo. With potentially some 24 institutions under cap 320 plus the 8 UGC funded universities it may in fact be a very crowded space in which to operate on the same scale as at present.

CONCLUSION

This case study has attempted to demonstrate that HKU SPACE has been a successful example of a hybrid institution that is inclusive in its approach to learners and provides opportunity for lifelong learning in particular. It also demonstrates scalability in that it is able to deal with large numbers of students as well as providing niche opportunities. Overall, the institution is successful (i.e. sustainable) in a very competitive environment yet can offer needed programmes that do not make ends meet as well as very successful ones (i.e. cross subsidy). Thus, HKU SPACE is an institution that can offer accessibility as well as resilience and quality provision.

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Author's Contributions (CRediT)

John Cribbin: Conceptualization, methodology, formal analysis, investigation, data curation, visualization, writing—original draft preparation, writing—review and editing; The author has read and agreed to the published version of the manuscript.

Sustainable Development Goals (SDGs)

This study is linked to the following SDG(s): Quality education (SDG 4), Decent work and economic growth (SDG 8), Industry, innovation and infrastructure (SDG 9), Sustainable cities and communities (SDG 11), Responsible consumption and production (SDG 12), and Partnerships for the goals (SDG 17).

The Distance Learning Platform for Crypto Enthusiasts: Learn Blockchain, Build the Future: Anywhere, Anytime

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ABSTRACT

This paper proposes a roadmap for distance higher education as a hub for blockchain and cryptocurrency education. Regarding innovation, the program implements future financial technologies and systems. In terms of ethics, the program emphasizes the importance of ethical responsibility in implementing blockchain technology. Meanwhile, in terms of applications, it aims to inspire students with the transformative potential of blockchain in various industries. Qualitative research design with responses from 30 respondents related to crypto and blockchain. Respondents included educators, students, exchange platform users, DApp developers, miners, technical experts, entrepreneurs, and members of the public. This model highlights individual needs and technologies related to formal crypto and blockchain education. This article describes conventional universities implementing blockchain technology in their educational systems. This article does not promote a particular study program, although, to date, no open university has become a pioneer and leader in distance education for blockchain and crypto enthusiasts. Overall, this article makes a significant contribution to and guides distance education, addressing the challenges and needs of formal blockchain technology education. This program presents business opportunities with high growth potential, low costs, a competitive advantage, and a global reach. The program not only future-proofs education but also positions the Open University as a global leader in blockchain learning. The program's primary target is students and professionals interested in blockchain careers, as well as investors and traders seeking formal education in cryptocurrency finance. Secondary targets are employee training on the blockchain, universities and academic institutions adopting blockchain, and governments as policymakers on digital assets. The roadmap for creating this program includes research and planning, infrastructure development, content creation, partnership testing, launch and marketing, and expansion. The curriculum design is a modular course development that balances theory with practical skills, covering a path from beginner to advanced and incorporating trending topics such as DeFi, NFT, smart contracts, and blockchain security. The teaching method employs both synchronous and asynchronous approaches. The learning media utilize gamification (e.g., blockchain coding challenges), provide virtual labs to simulate blockchain networks and use artificial intelligence to personalize the learning path.

Keywords

blockchain; cryptocurrency; distance education hub.

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INTRODUCTION

Blockchain is immutable and decentralized, with the function of storing and verifying transactions. The advantage of blockchain is its decentralized nature, but its data is recognized for its accuracy and security. Blockchain technology enables transactions without a third-party intermediary, maintaining a ledger verified through a consensus algorithm (Ocheja et al., 2022). Blockchain fundamentals consist of three: 1) distributed ledger technology, ensuring the system is not based on a single failure, so that multiple distributed mechanisms ensure that if an error occurs on one side, the system does not collapse or malfunction; 2) a consensus mechanism to verify data integrity; 3) smart contracts: automating the processing of data sent to the blockchain network.

Meanwhile, Artificial Intelligence (AI) is an algorithm and system for predicting, classifying, and automating data. AI is data management. Therefore, blockchain and AI collaborate, ensuring data accuracy while AI extracts value from it. AI fundamentals include:

1. Machine Learning: AI models are trained using data sets to make predictions
2. Neural networks: deep learning models for complex tasks
3. Federated learning: training raw data locally and then using it for general models, and the data is never shared with other parties.

AI can be utilized to optimize blockchain operations, including:

1. Consensus algorithms: using AI to improve the efficiency of Proof-of-Work (POW) and Proof-of-Stake (POS). For example, AI detects whether the network is busy with transactions at certain times
2. Fraud detection: AI algorithms analyze suspicious transaction patterns
3. Behavioral analysis: detecting crypto user behavior to improve blockchain performance.

The widespread adoption of blockchain and crypto is already underway. Therefore, the active role of universities is needed to ensure systematic evaluation of knowledge and its widespread implementation at lower levels of education. This paper examines the perceptions of academics, practitioners, and the public as a basis for establishing study programs related to blockchain, particularly crypto.

Distance learning opens up broader opportunities for providers and users because the education system is already accustomed to and tested for large-scale digital learning. However, unfortunately, no

open universities have yet recognized this opportunity. Meanwhile, blockchain enthusiasts, particularly those interested in crypto, embrace the philosophy of freedom, thus requiring education with the same philosophy: accessibility anywhere and anytime. This is due to the 24-hour, cross-border crypto trading experience, without the complex bureaucracy of conventional banks.

METHODS

This study employed a quasi-qualitative method. Data were sourced from 30 respondents, including educators, students, exchange platform users, Dapp (Decentralized Application) developers, miners, technical experts, entrepreneurs, and community members. The research instrument used an interview guide. Interview questions aimed to explore their perspectives, experiences, and roles in the crypto ecosystem (Table 1). Data analysis used coding, categorization, and memos.

Table 1. Interview guidelines

Respondent Type	Perspective (a)		Experience (b)			Role (c)
Educator	1.a.1	What is the biggest misconception students have about crypto-currencies?	1.b.1	What challenges do you face in teaching crypto-currency-related subjects?	1.c.1	How do you see the role of academics in advancing blockchain technology?
	1.a.2	Do you believe formal education is keeping pace with crypto innovation? Why or why not?	1.b.2	Do you address skepticism or regulatory issues in your teaching?	1.c.2	How do you incorporate cryptocurrency and blockchain topics into your curriculum?
Student	2.a.1	Do you believe in cryptocurrency as a viable financial system? Why or why not?	2.b.1	What motivates your interest (or disinterest) in crypto?	2.c.1	What educational resources do you find most helpful for learning crypto?
	2.a.2	What concerns (e.g. security, regulation, volatility) do you have about crypto?	2.b.2	Have you ever invested in or used crypto? If so, what was your experience?	2.c.2	Do you think universities are adequately preparing students for crypto-related careers?

Exchange platform users	3.a.1	How do you assess the risks of crypto trading/investing?	3.b.1	Which exchange platform do you use, and why?	3.c.1	What factors influence your trading or investment decisions?
	3.a.2	How do regulatory changes affect your trading behavior?	3.b.2	Have you ever experienced a security issue (e.g., hacking, fraud) on an exchange?	3.c.2	What improvements do you suggest for the exchange platform?
DApp Developers	4.a.1	What strategies do you use to attract and retain customers?	4.b.1	What are the most significant technical challenges in DApp development?	4.c.1	What blockchain platform do you use to develop your app, and why?
	4.a.2	How do you see the regulatory landscape impacting DApp innovation?	4.b.2	How do you handle gas fees and transaction speed issues?	4.c.2	How do you ensure security and scalability in your applications?
Miners	5.a.1	Do you participate in a mining pool? Why or why not?	5.b.1	How do energy costs and environmental issues affect your operations?	5.c.1	What hardware and software do you use for mining?
	5.a.2	What alternatives would you consider if mining became unviable?	5.b.2	How profitable is mining for you right now?	5.c.2	Do regulatory changes affect your mining activities?
Technical Experts	6.a.1	How do you assess the trade-off between decentralization, scalability, and security?	6.b.1	What are the most significant security vulnerabilities in current blockchain systems?	6.c.1	How do you see Layer 2 solutions evolving?
	6.a.2	What are the most significant barriers to mainstream blockchain adoption?	6.b.2	What is the dominant factor you use when predicting market movements for a particular coin? Is it the chart or global issues?	6.c.2	How often do you do technical analysis in a week?
Entrepreneurs	7.a.1	How do you navigate regulatory uncertainty in your operations?	7.b.1	Have you ever used DeFi or NFTs in your business model? If so, how?	7.c.1	How does your business integrate blockchain or cryptocurrency?

	7.a.2	What advantages does crypto offer over traditional financial systems for your business?	7.a.2	What challenges do you face in gaining the trust of customers or investors?	7.c.2	What market gap is your startup trying to address?
Community Members	8.a.1	What are the most common concerns expressed by newcomers?	8.b.1	How did you get involved in the cryptocurrency community?	8.c.1	What is your role (e.g. educator, moderator, organizer)?
	8.a.2	How do offline and online crypto communities differ in terms of engagement?	8.b.2	How do you address misinformation or fraud in the community?	8.c.2	What initiatives are most effective in increasing crypto adoption locally?

FINDINGS AND DISCUSSION

Findings

Data were collected between May and June 2025. Based on the interview results, coding, categorization, and memoing were conducted. An analysis of respondents' answers is presented in Table 2.

Table 2. Data Analysis of Respondents' Answers

No	Respondent's Answer	Code	Category	Memo
1.a.1	Students often think crypto is only for illegal activities, so I debunk those myths with case studies.	Debunking the Myths Misconceptions about Illegal Activities	Educational Challenges Public Perception	Educators stress the need for a dynamic curriculum to counter misinformation.
1.b.1	The biggest challenge is keeping up with rapid change; what is relevant this semester may be outdated next year.	Rapid Change	Curriculum Adaptation	
2.a.1	I am hesitant to invest because I do not understand how taxes work.	Tax confusion	Regulatory Barriers	Fear of regulatory complexity hinders participation. Students seek decentralized sources of knowledge due to gaps in formal education.
2.c.1	I got to know crypto through YouTube.	YouTube Learning	Informal Education	
2.c.2	My university does not offer a course on this.	There are no university courses	Institutional Gaps	
3.a.2	Regulation is a double-edged sword—it increases security but limits access.	Duality of regulation	Trust Freedom vs.	Regulatory ambiguity creates a trust-security paradox

3.b.1	I use Binance for liquidity, but I'm worried about hacks	Concerns about hacking	Security Concerns	Users balance centralized security with DeFi autonomy
3.c.1	I also diversify across various DeFi protocols.	Diversification	Risk Management	
4.b.1	Our biggest challenge is onboarding non-tech users who struggle with wallets.	Onboarding Friction	User Experience	Platform loyalty is flexible based on technical constraints
4.b.2	Building on Ethereum is expensive due to gas fees.	Gas Fees	Scalability Issues	Developers prioritize cost and speed
4.c.1	So we migrated to Solana.	Migration to Solana	Platform Options	
5.b.2	Profitability is down 60%, but my cheap hydro power is helping.	Hydropower	Sustainability	Renewable energy reduces profitability concerns.
5.c.1	After Ethereum switched to PoS, I switched to Kaspa mining	PoS Transition	Industry Shift	Miners adapt to algorithm changes but are vulnerable to policy shifts
5.c.2	I will stop if regulations prohibit PoW	Threat Regulatory of Exit	Policy Dependence	
6.b.1	Most hacks happen because of rushed smart contracts, not because of blockchain weaknesses	Smart contracts in a hurry	Security Risks	Human error, not technology, is the weak link
7.b.1	We use crypto for cross-border B2B payments to avoid fees.	Cross-border payments	Use Cases	The crypto value proposition centers on cost efficiency.
7.c.2	Banks are our biggest competitors	Bank competitors	Institutional Resistance	Traditional finance resists disruption
8.b.2	The biggest problem is fraud—people put too much trust in influencers.	Fraud	Trust Issues	Influencer culture increases risks
8.c.1	I host meetups to teach newcomers some basic info about crypto	Meeting	Grassroots Education	Communities build trust and combat mis-information

Based on Table 2, the following results were obtained. Educators emphasized the need for a dynamic curriculum to combat misinformation due to the rapid pace of change. Therefore, formal institutions need to adapt quickly. Consequently, students seek decentralized sources of knowledge through the internet and social media due to the significant gap in crypto information in formal education. However, the ease and abundance of information circulating on various social media platforms allow

anyone to provide information or become an influencer regarding cryptocurrencies or market trends. This increases the risk of fraud or misinformation. One alternative being implemented by blockchain and crypto activists is to form communities to build trust and combat misinformation.

However, users and observers are concerned about the complexity of cryptocurrency regulations. This has hindered their participation in investing in the crypto world. Furthermore, regulatory ambiguity creates a paradox of trust in the security of personal data and investments. Human error, not technology, is the weak link. Among the alternatives users are taking is balancing the convenience of centralization with the autonomy of DeFi. Miners adapt to algorithm changes but are vulnerable to policy shifts.

Meanwhile, based on blockchain or crypto user experience, platform loyalty is flexible based on technical constraints. Developers prioritize cost and speed. Renewable energy alleviates profitability concerns. Traditional finance resists disruption. Crypto's value proposition centers on cost efficiency.

Discussion

Based on the analysis in subsection 4.1, the author proposes developing a roadmap for establishing a crypto study program. This roadmap encompasses research and planning, infrastructure development, content creation, partnership testing, launch and marketing, and expansion.

Research and Planning

The research and planning phase includes market research and competitor analysis, determining course structure and pricing models, and conducting a literature review on blockchain in education. Blockchain-based digital credentials for lifelong learning are beneficial because students can customize their learning according to their needs, and their track record is well-documented (Salajan, 2019). The growth and trends of blockchain in educational research (Ocheja et al., 2022) between 2016 and 2018 showed no significant growth in blockchain integration with educational technology. Furthermore, the evolution of blockchain in education between 2019 and 2021 demonstrated growth, with an overlap between "blockchain-based data" and "blockchain education," which focuses on certification.

To address misinformation, there needs to be standardization of education about blockchain and crypto. This aligns with Grech & Camilleri's (2017) research, which analyzed blockchain's potential for educational credentials in Europe and provided policy recommendations for standardization. Meanwhile, Ocheja et al. (2019) introduced Blockchain of Learning Logs (BOLL), which can be used to track learning achievements beyond traditional transcripts using blockchain and smart contracts. BOLL enables learners to securely transfer their learning records between institutions, thereby addressing the cold-start problem in learning data analytics platforms. This paper investigates how learning records can be linked between institutions using BOLL, detailing its implementation, resource requirements, and advantages over similar tools. Woolf University, the First Blockchain-Based University (Broggi et al., 2018), uses Ethereum-based smart contracts to automate student enrollment, tuition payments, and accreditation tracking. This is useful for reducing overhead costs and ensuring transparent accreditation.

Several conventional universities have already offered courses related to blockchain and the crypto world. Below is a comparison of the systems and performance offered by each program (Table 3).

Table 3. Comparison of Campuses Providing Blockchain and Digital Currency Courses

No	Campus Name	Degree Program	Curriculum	Performance	Source
1	University of Nicosia, Cyprus	The world's first official Master's degree, "MS in Digital Currency" (since 2013). Free course "Introduction to Digital Currencies" (online).	Focus on technical (cryptography, smart contracts) and economic (monetary, regulatory) aspects. Practical projects using the Bitcoin blockchain.	Collaborations: Partnerships with IBM, Waves Enterprise. Alums: Working at crypto companies Reputation: Recognized as a pioneer in blockchain education.	www.unic.ac.cy
	MIT (Massachusetts Institute of Technology), United States of America	Blockchain concentration in Computer Science & Business. MIT Digital Currency Initiative (Bitcoin/Lightning Network research).	Technology (including DeFi) + Ethics/Social. Use of Open Learning for online courses.	Collaboration: Partner with the Federal Reserve and the World Bank. Innovation: Co-funding projects like Bitcoin Core development Impact: Alumni-led startups	www.dci.mit.edu
	Stanford University, United States of America	Course "Cryptocurrencies and Blockchain Technologies" (CS251). Special lab Center for Blockchain Research.	Crypto mathematics (elliptic curves), scalability, consensus algorithms	Collaborations: Ethereum Foundation, Polkadot. Research: Influential papers on sharding and rollups. Startups: Alumni founded Solana and Filecoin.	www.online.stanford.edu
	National University of Singapore (NUS)	Master's in Digital Financial Technology (blockchain + AI + FinTech). Professional certificate "Blockchain for Business"	Combination of engineering and business (tokenomics, CBDC).	Collaboration: Monetary Authority of Singapore (MAS), Binance. Impact: Graduates dominate Southeast Asia's FinTech sector.	www.masters.nus.edu.sg

Based on Table 3, it can be concluded that the potential for study programs related to blockchain and crypto remains enormous. Furthermore, no campus with a distance learning system offers formal, tiered education starting from the undergraduate level. This presents an opportunity for open universities. If necessary, communities like ICDE can serve as a platform for the formation of formal, cross-border blockchain and crypto education communities. Several collaborations are highly feasible, including technology development and educational implementation for the public.

Infrastructure Development

The curriculum design takes the form of modular course development that balances theory with practical skills, covering a pathway from beginner to advanced, ensuring accessibility for all levels, and incorporating trending topics such as DeFi, NFTs, smart contracts, and blockchain security. The teaching method uses a combination of synchronous and asynchronous. Learning media utilizes gamification, is based on real-world blockchain projects, virtual laboratories to simulate blockchain networks, and uses artificial intelligence to personalize learning paths. Chen et al (2018) introduced the features and advantages of blockchain technology and explored several blockchain applications for education.

The stages involved include:

1. Developing an LMS platform
2. Implementing blockchain-based certificates
3. Setting up a crypto payment system
4. Creating beginner, intermediate, and advanced modules

Infrastructure preparation can be done gradually, with validation of the implementation process. In other words, once a study program has been launched, the minimum infrastructure must be met. A summary of infrastructure preparation can be seen in Table 4. Blockchain models consist of three types: public, private, and consortium. Public blockchain models are transparent but require higher costs for creation and operation.

Meanwhile, private blockchain models tend to be more efficient and controlled, but with limited access. On the other hand, the consortium blockchain model is moderate, combining public and private models. This can accommodate the needs of both parties. However, it requires additional oversight to ensure focused implementation. Smart contracts that can be developed in the educational world include student registration and tuition payments through cryptocurrency. This requires educating prospective and continuing students about security and sustainability to keep up with the times. Another idea for a certificate contract is the automatic issuance of certificates and credentials upon course completion. Courses do not have to be about blockchain, but certificate creation can use smart contracts. This can be a joint project between lecturers and students, giving students a sense of ownership of their projects and a responsibility to preserve their findings. Another smart contract idea is tracking learning progress and assignment deadlines. Especially in distance learning, with a larger student population than in conventional campuses, applications are needed to monitor the quantity and quality of all courses, especially in terms of assignment submission. For tokenization, the campus should not only be the organizer but also the implementer of the findings developed. In this case, the provision of incentives, which are usually done manually, can now be tokenized. This way, tokenization can be implemented immediately and widely on campus. Meanwhile, tokenization for students can begin as an initial step with a scholarship program. Project-based scholarship programs foster a sense

of responsibility, not only for graduating on time with the required academic performance index but also for developing ready- to-use skills and becoming active users of their campus' products, particularly in the world of blockchain and crypto.

Table 4. Infrastructure Preparation

Blockchain Model	Smart Contracts	Tokenization
Public: transparent but expensive	Student registration and tuition fee payments via cryptocurrency	Tokenization of employee incentives
Private: efficient and controlled	Automatic issuance of certificates and credentials upon completion of the course	Tokenization of scholarships
Consortium: a combination of public and private	Track learning progress and assignment submission deadlines	

Content Creation

Cultivate curiosity and adaptability to keep pace with the rapidly evolving blockchain landscape. Foster a culture of lifelong learning and critical thinking. Encourage ethical responsibility in the application of blockchain technology. Content creation involves recording video lectures and developing quizzes and project-based assessments related to cryptocurrency. Educate using a variety of engaging media, such as 1-minute videos.

Early content creation can simplify explanations of blockchain and crypto by linking them to classroom learning within the course. The following interactive examples can be used in classrooms to introduce blockchain and crypto concepts.

Example 1. Interactive simulation of introduction to blockchain and crypto concepts

1. Blockchain: An open, cheat-proof class notebook

- Lecturers and students agree to use a "shared notebook" for note-taking. This notebook can be created via a shared drive, a digital book, or a specific application for online learning. The notebook contains three main elements:
 - 1) Who answered the question
 - 2) How many points did they get
 - 3) When were the prizes awarded?
- The competencies that students are expected to master through the "shared notebook" simulation are that blockchain has the following properties:
 - 1) Transparent: All students can view notes and receive notifications about changes, preventing cheating.
 - 2) Secure: If a student cheats by altering notes without proper documentation (for example, claiming they or their group received 100 points when they should have received only 10), all students in the class will be notified and will protest, as this constitutes a rule violation.

- 3) Decentralized: A "shared notebook" system ensures that both the lecturer and students record the notes, and both parties verify the accuracy of the recorded data.
2. Crypto: Class reward coin
- The lecturer created a "smart coin" as a reward. The coin can be created as a digitally appealing symbol. This "smart coin" embodies the principle that:
 - 1) One coin represents one correct answer.
 - 2) A certain number of coins can be exchanged for privileges. For example, the privileges agreed upon from the start are:
 - a) 10 coins = become a leader and choose your team for group assignments
 - 30 coins = skip any mandatory assignments
 - b) 50 coins = get at least a C grade
 - c) 100 coins = pass the exam with an A grade, and do not have to take the final exam
 - The competencies that students are expected to master through the "smart coin" simulation are that crypto has the following properties:
 - 1) Digital: Coins exist only in a "shared notebook," not as physical coins.
 - 2) Agreed-upon value: Coins have value or a price because the entire class agrees they can be exchanged for prizes.
 - 3) Blockchain required: Without an honest "shared notebook," coins can be counterfeited, as in the previous example, where a student claimed to have 100 points when they did not.
 - 4) Cryptocurrency is a digital currency that relies on a blockchain system.

Blockchain knowledge can be diversified according to needs and incorporate some terminology for ease of understanding. Therefore, blockchain can be helpful in education, for example, for distributing lectures or learning notes, reputation management, and awards, enabling decentralized achievement management, including personalized student customization (Sharples & Domingue, 2016; Siemens & Long, 2011).

The interactive simulation example above can be expanded upon to introduce the concept of smart contracts and implement them in classroom learning. The challenge is accurately translating privacy policies into smart contract logic. Smart contracts are implemented to represent and enforce privacy policies, such as permissions regarding who can access specific data under certain conditions (Ocheja et al., 2019).

Partnership Testing

Support students in building their own blockchain projects or startups. Develop a "Blockchain Innovation Lab" where students can collaborate on real-world solutions. Initial testing will be required with 100 students, with a maximum of 50 students per class.

Next, partnerships with blockchain companies are needed to enhance the credibility of the program's practical applications. Build public awareness to avoid skepticism. Inspire students with blockchain's transformative potential in industries such as finance, healthcare, supply chain, and governance. Establish partnerships with blockchain companies and industry organizations. Encourage internships and collaboration opportunities with blockchain companies. Host regular meetups and conferences. Include alums from universities hosting blockchain programs. Build an alum network for ongoing mentorship and collaboration.

Launch and Marketing

In this phase, the public is introduced to blockchain and crypto through short courses. If they need advanced skills, they can take formal diplomas or undergraduate programs.

Divide the semester into short learning sprints with clear goals. Use a "time blocking" system for lectures, labs, independent study, and projects. Hold workshops on time management techniques. Provide a mentoring program to help students stay focused, with the following steps:

1. Select a small group of universities or online learning platforms
2. Implement blockchain-based credential verification
3. Provide token-based rewards to students for their participation
4. Evaluate system performance and gather feedback
5. Launch globally with advertising and social media campaigns
6. Offer early bird discounts
7. Start affiliate and influencer marketing

Project-based classes and mentorship are necessary, along with down-streaming opportunities such as commercialization and product patents, to benefit both students and lecturers. Collaboration with exchanges promotes productivity. Develop a "Blockchain Innovation Lab" where students can collaborate on real-world solutions. However, controls are needed to ensure the security of student data and creativity. Therefore, ethical and privacy principles in learning are crucial for institutions, including protecting student data while still utilizing analytics to improve education (Pardo & Siemens, 2014; Rubel & Jones, 2016). Here is an interactive example of a simple introduction to the blockchain concept through a project or case study.

Example 2. The interactive simulation in Example 1 can be further developed into a class-based project with blockchain and smart contract concepts. The instructor will inform students about the project, from its objectives to the assessment rubric. This ensures agreement and transparency from the outset.

A. Learning Objectives

Students are expected to be able to:

1. Understand the concepts of blockchain, cryptocurrency, and smart contracts
2. Apply the principles of transparency, decentralization, and digital security

B. Tools and Materials

1. Paper/index cards (as "blocks")
2. Markers/stickers (as "tokens")
3. Whiteboard/digital board (for "public ledger")

C. Project Procedures

- a) Create a "shared notebook" = blockchain
 - i. Each student creates a "block" (piece of paper) containing:
 1. block number (e.g., Block 1),
 2. transaction (e.g., "The lecturer gave 10 points to Fatia")
 3. digital signature (lecturer and student initials)
 - ii. Combine the blocks to form a symbol/image of the chain
- b) Trading "smart coins" = crypto
 - i. Students make a transaction (e.g., Fatia buys one book from Fatimah with five smart coins)
 - ii. The class must validate the transaction by recording it on the whiteboard/digital ledger
- c) Create a smart contract
 - i. Create automated rules (e.g., if Fatia sends five smart coins to Fatimah, then Fatimah is required to send one book)
 - ii. Simulate the use of the smart contract with an agreement card that is known to all students and the lecturer in the class.

D. Assessment Rubric

The assessment rubric can use 4-soft sets (Fatimah et al, 2018) by referring to the following Rubric Table 5.

Table 5. Class-Based Blockchain Project Assessment Rubric

Criteria	0 (Need Guidance)	1 (Enough)	2 (Good)	3 (Very good)
Concept Understanding	Cannot explain blockchain/crypto	Explaining with the help of simulation examples	Explaining with the help of real examples	Explaining with original analogies and new examples
Participation	Passive, does not participate in transactions	Participates in 1-2 transactions	Participates in 3-4 transactions	Actively validates & proposes smart contract ideas
Creativity	Just copying the example	Minor modifications to transactions	Intermediate modifications to transactions	Create a new, unique smart contract
Collaboration	Not cooperating	Cooperates when asked	Initiative to work together	Lead validation and help friends

Expansion

The program will be expanded to include modules on communication, teamwork, and problem-solving. Courses on blockchain ethics, regulation, and compliance will be offered. This phase will require identifying challenges, including the most significant costs, topics related to government regulations, maintaining ongoing user adoption of the program, and issues related to data security. Possible solutions to consider include:

1. Use Layer-2 scaling solutions
2. Collaborate with the Ministry of Education and the crypto community
3. Provide blockchain education and training for lecturers and students
4. Implement a secure, multi-layer account verification model

Continuous monitoring and improvement are necessary in several areas. First, performance evaluation, specifically knowledge and development regarding transaction speed, user adoption rates, and cost-effectiveness. Second, regular updates to smart contracts and blockchain governance need to be monitored. Third, collaboration with blockchain experts and academic institutions for innovation.

The expected outcomes of this phase include at least four key elements. First, anti-fraud credential verification, including the elimination of fake certificates. Second, improvements in cost-saving methods to reduce administrative work in record-keeping. Third, faculty and students will gain a decentralized learning experience, enabling knowledge sharing among peers and colleagues. Fourth, accelerated global accessibility, allowing students from all over the world to enroll in classes without geographical limitations.

CONCLUSION, IMPLICATIONS AND SUGGESTIONS

This article does not promote any specific study program, although, to date, no distance-learning university has emerged as a pioneer and leader in blockchain and crypto education. These programs offer high-growth, low-cost business opportunities, competitive advantages, and global reach, positioning open universities as global leaders in blockchain learning. This paper proposes a roadmap for distance-learning higher education as a hub for blockchain and cryptocurrency education, with a focus on innovation, ethics, and real-world applications. Innovatively, these programs are expected to implement future technologies and financial systems; ethically, they emphasize ethical responsibility in implementing blockchain technology; and in real-world applications, they inspire students with blockchain's transformative potential in various industries. Current challenges include barriers to institutional adoption and scalability. Continuous research involving academics and practitioners is needed regarding a standard framework to address privacy issues so that every user can feel secure working and investing in the crypto world.

Future blockchain research in education should address the development of a blockchain education roadmap from early childhood through higher education, involving both academics and practicing users. This will ensure education is not merely theoretical development but also implementation to address local and global issues. It is crucial to continuously improve the quality and strength of collaboration across scientific fields and regions, ensuring the adoption of blockchain technology in both formal and informal education.

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Bridging AI Literacy and Information Evaluation within the Information Literacy Space

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ABSTRACT

This paper explores the intersection of Generative AI and information literacy, emphasising the need for enhanced information evaluation skills. As AI-generated content proliferates, educators must adapt their teaching strategies to include AI literacy within the broader information literacy framework. This paper extends the holistic Information Literacy Spaces model to situate AI literacy as a key component of information literacy education. Additionally, the paper presents a te ao Māori-informed information evaluation framework, Te Whatu Aho Rau, which draws on indigenous values to enhance learners' ability to critically assess the context, relevance and credibility of information sources. The framework aims to foster a more holistic understanding of information literacy, empowering learners to navigate the complexities of the digital information landscape and AI-produced content with confidence.

Keywords:

Critical information literacy, information evaluation, Generative AI, indigenous knowledge, AI literacy

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INTRODUCTION

In late 2022, the emergence of Generative AI (Gen-AI) tools (most notably ChatGPT) fundamentally disrupted education in ways that we are still discovering and navigating. Initial calls to completely ban Gen-AI in assessments have shifted to more nuanced conversations about capturing the affordances and mitigating the challenges AI creates for learners and educators (McIntosh, 2025). In a range of research and media articles, and educator blogs, we observe conflicting insights into how it can reduce barriers to learning while simultaneously increasing disadvantage through the widening digital divide, perpetuating embedded biases and violating intellectual property rights (Bjork, 2023a, 2023b, 2024; Mathais, 2023; Zhang et al. 2024). Educators are engaging in robust conversations about what meaningful tertiary learning looks like in the Gen-AI age.

In Aotearoa New Zealand universities, educators and students are feeling frustrated around ways AI is negatively affecting learning. Educators report being overwhelmed by hours being spent trying to determine whether learners have written their own assessments (Bird, 2025). When the tell-tale Gen-AI traits (Brown, 2024; Barron, 2023; Sweaney, 2023) signal its use in producing assessment outputs, educators attempt to distinguish between legitimate use, such as clarifying, refining and expanding ideas or polishing language, and the outsourcing of thinking and writing submitted as learners' own work, which breaches academic integrity. More worryingly, outsourcing text analysis and summary to AI creates surface-level engagement which may lead to an unhealthy over-reliance of AI to make sense of the arguments. Students who are genuinely completing their own assessment tasks are feeling stressed by false accusations stemming from faulty AI detection tools (McGregor, 2025).

A key red flag related to information literacy (IL) is the use of ideas without original source acknowledgement and the citation of AI-hallucinated ideas and fabricated sources appearing in reference lists. Librarians have indicated a growing number of learners are seeking help to locate sources suggested by AI, only to discover that although the sources are referenced in the correct format, they do not exist. Critical information evaluation is a vital element of IL as it enables learners to navigate increasingly complex information landscapes, which have become an information minefield due to an increase in carefully crafted, rapidly spreading misinformation and disinformation. As Gen-AI tools fabricate sources and fail to credit the authors and origins of ideas, the need for effective evaluation skills is more urgent than ever.

This paper positions AI literacy as a critical concern within the broader information literacy space, drawing on the Information Literacy Spaces Model (Feekery, 2017; Emerson et al 2021) to frame this relationship. It introduces Te Whatu Aho Rau – He Anga Arotake (co-developed by the authors in 2024), as a culturally-grounded information evaluation framework designed to strengthen learners' information evaluation capabilities. The paper argues that, in the face of AI information challenges including hallucinated sources, fabricated citations, and decontextualised outputs, critical information evaluation must be explicitly taught and assessed in tertiary learning, particularly during key transitional stages of tertiary learning. Te Whatu Aho Rau – He Anga Arotake supports learners to engage more deeply and ethically with the information evaluation process, helping them recognise that while Gen-AI may assist with refining ideas and polishing language, it is not an authoritative source of knowledge. The framework offers a pedagogical response to growing concerns about learners' surface-level engagement with information, providing a means to capture evidence of critical and

reflective source use. In doing so, it reduces the likelihood of learners bypassing the critical evaluative process and outsourcing assessment tasks to Gen-AI.

UNDERSTANDING INFORMATION LITERACY

Angela first encountered the term ‘information literacy’ in 2010 after securing a doctoral research scholarship to investigate how IL could be explicitly embedded within disciplinary teaching. Although she had been teaching academic skills courses for several years, the term was initially unfamiliar. Through conversations with university librarians across Aotearoa, she encountered a shared frustration: IL was often confined to the domain of the library, rather than recognised as integral to broader academic practice. At one university, the library was aligned with ‘buildings and maintenance’ rather than with ‘academic and research’ within the organisation’s strategic documents. Similar concerns emerged in secondary education, where libraries were often under-resourced and overlooked. Across both sectors, IL appeared to occupy a marginal position within the academic landscape.

Over time, Angela came to understand IL as fundamental to educational practice. Yet, the conventional and often-cited American Library Association Presidential Committee (1989) definition, ‘the ability to find, evaluate, and use information’, felt too narrow. It failed to capture the depth of engagement she hoped to foster in her classrooms. She wanted learners to learn to navigate the overwhelming volume of online information by critically interrogating sources to discern credibility and relevance and engaging with the ideas and conversations of others in ways that were ethical, contextual, and relational.

Angela’s evolving understanding was further shaped by broader holistic conceptualisations of IL, including Jane Secker and Emma Coonan’s (2013) *A New Curriculum for Information Literacy* (ANCIL), Chrisine Bruce’s (2008) *Informed Learning* framework, and the Association of College and Research Libraries’ (ACRL) (2015) revised *Framework for Information Literacy for Higher Education*. These models moved beyond technical skillsets to frame IL as a complex, situated practice where learners are not simply passive consumers of information but rather active participants in knowledge creation and meaning-making within rapidly evolving information environments.

INSIGHTS FROM THE INFORMATION LITERACY SPACES PROJECT

Understanding that IL as a practice was bigger than the library or the classroom, the idea of considering information literacy as a space we inhabit as educators, and information creators and consumers, emerged as the key concept underpinning what came to be called the Information Literacy Spaces Project in 2016. This nuanced view led the project team to consider what the ‘information literacy space’ actually entails. We came to understand it as the convergence of multiple influences: the contributions of librarians and libraries, disciplinary approaches and teaching practices, digital tools and infrastructures, and the broader institutional environments in which learning takes place. It also contains cognitive (thinking around information seeking), affective (confidence and curiosity around information), sociocultural (norms, values and power relations embedded in information contexts) and ethical (authority, trust, ownership and responsible use) dimensions of information use (Lloyd, 2010). These influences shape the development of capable, critical, information-literate learners. In the project, the space we were exploring was how IL informed and supported the transition between

senior secondary education at Year 12 and 13 and for learners in their first year tertiary study in the polytechnic and university sectors.

Although teachers, librarians and learners are key participants in shaping both the understanding and practice of IL, when it is discussed outside of library settings, it is often framed too narrowly as basic 'research skills'. Because we were working with teachers who were unfamiliar with what we meant by IL (as Angela had been initially), we needed to talk about IL using a shared language that resonated across educational sectors. We did this in two ways:

1) We developed our own holistic definition of IL to better reflect its centrality to learning: *IL involves the processes, strategies, skills, competencies, expertise and ways of thinking which enable individuals to engage with information to learn across a range of platforms (both digital and traditional learning environments), transform the known, and discover the unknown* (Feekery, 2016).

2) Angela developed our project IL model (initially called the *Feekery Information Literacy Model*, 2017) by expanding Secker and Coonan's (2013) *Information Literacy Landscape* model. Their framework comprises five interrelated literacy domains, each with associated competencies: information literacy (critical analysis, critical thinking, and evaluation); academic literacies (learner development, study skills, and academic writing); media literacy (critical engagement with non-textual formats); digital literacy (search skills, ethics, and e-safety); and new literacies (multimodal learning and transliteracies).

Our more detailed project model (Figure 1) maintained IL as central to and interwoven with the four other literacy domains, highlighting the interconnected competencies learners need to develop as they transition from secondary school to tertiary study and into professional contexts. The placement of concepts within the IL domain was guided by how we perceived they intersected with other literacies in the tertiary education context. For example, ethics and critical thinking emerged as foundational elements that underpin all domains, while research and critical analysis were closely aligned with the demands of academic and disciplinary learning. Similarly, search strategies and social media use naturally connected with digital and media literacies, while concepts such as connectedness, creativity, and innovation reflected competencies increasingly valued by the professions our learners are preparing to enter.

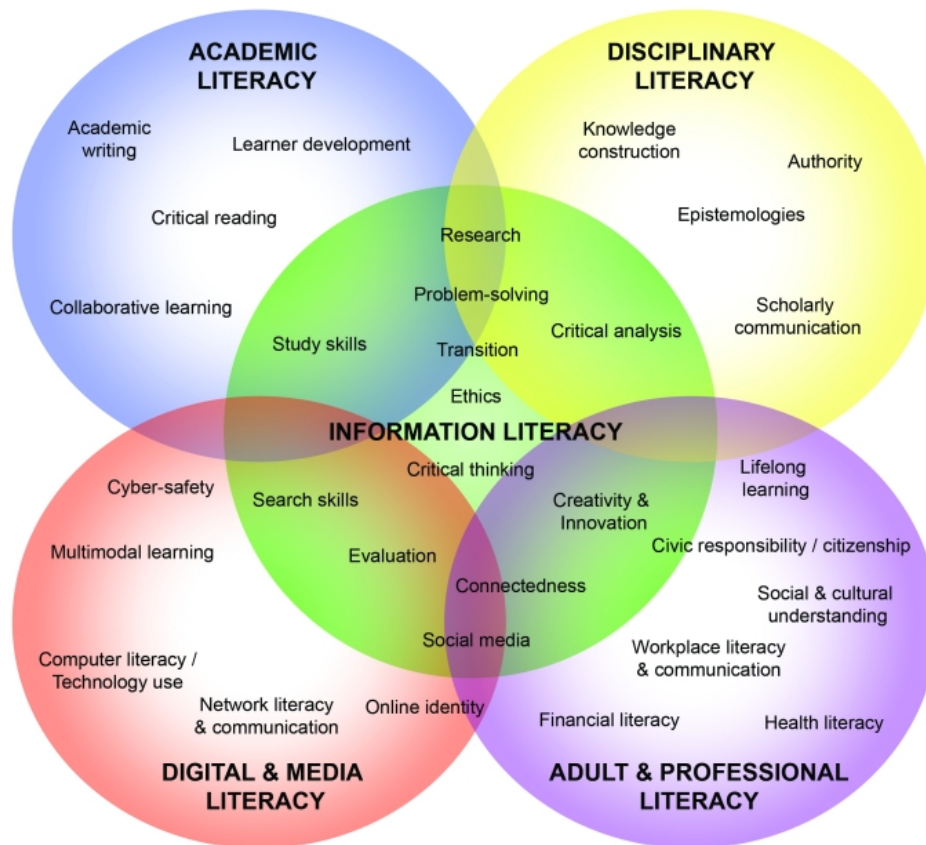


Figure 1. Feekery Information Literacy Model (Feekery, 2017)

The project IL model remained consistent in structure but was renamed the *Information Literacy Spaces Model* when findings from the project were published (Emerson et al., 2021; Emerson et al., 2023).

REVISED INFORMATION LITERACY SPACES MODEL (2025)

In 2025, Angela expanded the *Information Literacy Spaces* model (Figure 2), repositioning some concepts to clarify their alignment with specific domains, and adding new concepts within each domain to capture our evolving understanding of the essential literacies and competencies that support learning within the IL space both now and into the future. The revised model still positions IL as the central literacy that equips learners to think critically, act responsibly, and participate meaningfully in increasingly complex and uncertain information environments. While the core purpose of IL remains consistent - supporting learners to navigate, evaluate, and create information - the updated model introduces key refinements within each domain. Collectively, these updates reflect a broader shift in how IL is understood, not just as a set of technical or academic skills, but as a complex, ethical, and future-focused literacy.

INFORMATION LITERACY SPACES MODEL

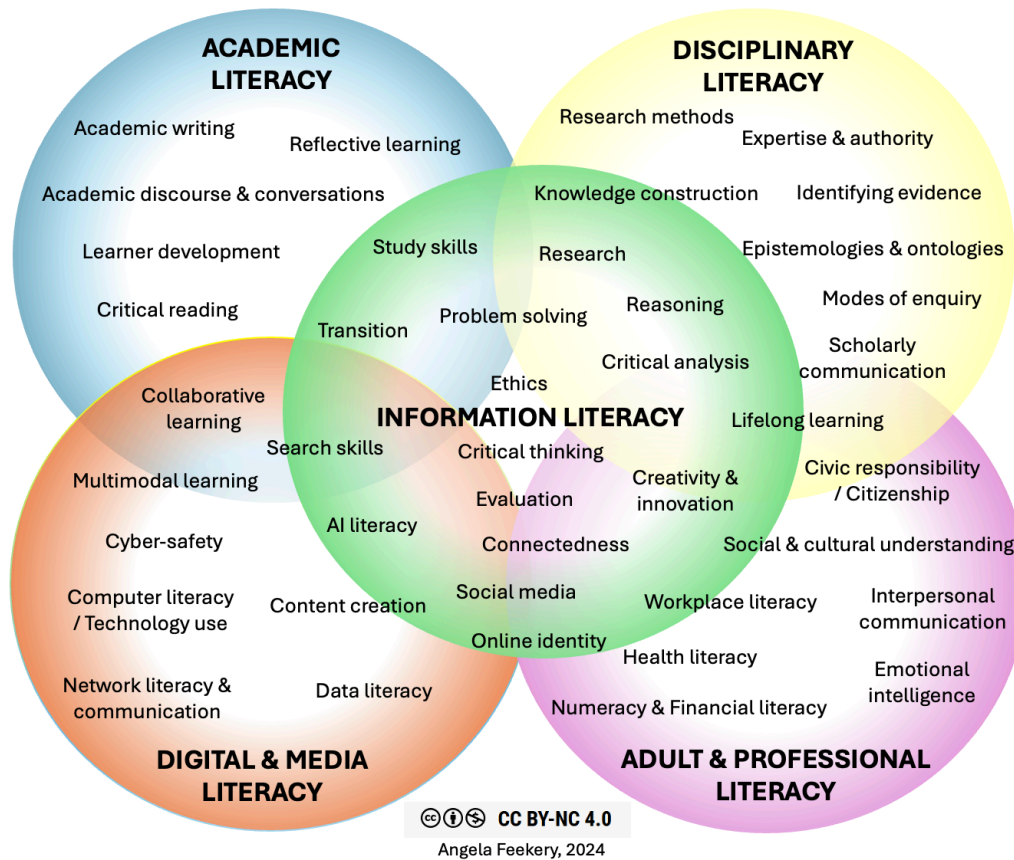


Figure 2: Information Literacy Spaces Model (Feekery, 2025)

An overview of each domain is as follows:

- Information Literacy** – IL is positioned at the centre of the framework, reinforcing its role as an, integrative literacy that connects and draws from the surrounding domains of Academic, Disciplinary, Digital & Media, and Adult & Professional literacies. This domain sits at the intersection of several key capabilities that support learners to navigate complex and evolving information landscapes within the educational sector (Head, 2012, Webber & Johnston, 2000). It encompasses ethical engagement with information, requiring learners to understand issues of authorship, credibility, and responsible use (ACRL, 2015). Central to this domain are problem solving and critical thinking skills that encourage learners to ask meaningful questions, analyse diverse sources, and make informed decisions (Facione, 2023; Limberg, et al., 2015). IL also involves proficient search strategies and the ability to critically evaluate the quality, relevance, and bias of information encountered across platforms. Evaluation highlights the need for learners to interrogate the origins, credibility, and context of information in an over-abundant information landscape flooded with misinformation. IL fosters connectedness by helping learners recognise relationships between ideas and sources, enabling them to synthesise knowledge and evidence across differing contexts. Research practices are also integral to IL, equipping learners to generate new insights, contribute to disciplinary conversations, and engage confidently in lifelong learning.

- **Academic Literacy** - This domain encompasses the foundational literacies and general competencies essential for successful participation in tertiary education. Academic literacy involves far more than the ability to read and write in academic settings. It reflects a broad set of interrelated competencies that support learners to access, interpret, produce, and communicate knowledge within scholarly contexts and academic genre conventions such as essays, reports, and reflections (Lea & Street, 1998). While not specific to any one discipline, core elements include the development of academic writing skills, such as structuring arguments learning how to express ideas clearly, and knowing how to reference sources appropriately (Hyland, 2009). Critical reading is equally important, enabling learners to analyse and evaluate academic texts, identify key ideas, question assumptions, and synthesise information across sources (Limberg, et al., 2012; Wallace & Wray, 2021). Collaborative learning through working with peers to discuss, challenge, and refine ideas, encourages active engagement with course content and fosters deeper understanding (Brufee, 1993). In addition, this domain involves broader transitional learner development, such as time management, self-regulated and self-directed learning, and metacognitive awareness (Zimmerman, 2002). Together, these competencies empower learners to engage confidently and critically with academic discourse, navigate institutional expectations, and build the capacity for postgraduate study and lifelong learning.

The *Academic Literacy* domain was extended to include *Reflective learning* and *Academic discourse & conversations*. These new elements broaden the domain to emphasise metacognitive awareness and the ability to understand how academic discourse and conversations are structured and shared. Reflective learning encourages learners to critically consider their own learning processes (Moon, 2004), while academic discourse and conversations highlights the importance of mastering general academic language and conventions like referencing, writing genres and they types of communication used in educational and research settings (Lillis & Scott, 2007). Together, these additions support transition into tertiary learning and enable a deeper and more meaningful contribution to academic communities.

- **Disciplinary Literacy** - Disciplinary literacy helps learners develop the ability to think and communicate like members of their research communities. It focuses on the specialised ways of knowing, valuing, and communicating knowledge within specific academic fields (Moje, 2015; Shanahan & Shanahan, 2017; Gibney & Tripathy, 2025). Each discipline has its own methods for constructing knowledge (epistemologies), valuing evidence, and determining what counts as credible or authoritative. For example, in scientific disciplines, knowledge is often developed through empirical research, data analysis, and peer-reviewed publication, whereas in the humanities, argumentation, interpretation, and critical discourse play a more central role. A key aspect of disciplinary literacy involves recognising who holds authority in the discipline, why their perspectives are valued, and how trust in information is established. Understanding these conventions is essential for learners to engage effectively within their chosen fields of study and build confidence and competence to navigate and contribute to disciplinary knowledge systems (Gibney &

Tripathy, 2025). Over time, learners transfer general academic skills into discipline-specific contexts, gaining the ability to contribute to knowledge production within their field (Moje, 2015). In this way, academic literacy supports learners to enter academic life, while disciplinary literacy enables them to contribute meaningfully to scholarly conversations.

The revised model extends the Disciplinary Literacy domain by adding *Research methods*, *Identifying evidence*, and *Modes of enquiry* as additional concepts and adding *Expertise to authority* and *Ontologies to Epistemologies*. These additions expand on the earlier focus areas of knowledge construction and understanding, scholarly communication, and recognition of authority by reflecting a more detailed insight into how knowledge is developed, validated, and shared within disciplines. These concepts support learners to identify what counts as evidence in a field, and understand how disciplinary norms and research design shape inquiry (Stahl, 2014). This reinforces IL's role in helping learners become active participants in disciplinary knowledge production.

- **Digital and Media Literacy** - This domain includes the essential competencies required to navigate, create, and communicate information in increasingly complex digital and networked environments. In today's information-rich world, learners must engage fluently across multiple modes and platforms, making multimodal learning using a combination of text, image, audio, video, and interactivity a key feature of this literacy (Koltay, 2011; Leaning, 2019). Proficiency in technology use and computer literacy underpins learners' ability to access digital tools, manage information systems, and troubleshoot technical challenges. Networked communication skills are also crucial, allowing learners to interact, collaborate, and share knowledge responsibly across digital spaces such as learning management systems, social media, forums, and collaborative workspaces. This domain also includes an understanding of cyber safety and digital well-being, equipping learners with the knowledge to protect their privacy, manage digital footprints, and engage ethically in online communities (Brison-Boivin, 2023; Latif, et al., 2023). Learners must develop and manage their online identities, understanding how they present themselves in academic, professional, and social contexts. Digital and media literacy also involves the ability to critically interpret media messages, identify bias and misinformation, and assess the credibility of digital content. These competencies are both vital for academic success and for meaningful participation in civic life, professional settings, and lifelong learning in our technology mediated world.

The revised model incorporates *AI literacy*, *Data literacy* and *Content creation*. AI literacy has been added to acknowledge the growing influence of artificial intelligence and LLMs in information production, communication, and everyday decision-making, including the ability to critically assess AI-generated content, understand algorithmic processes, and engage ethically with AI tools (Sundin, 2025). It also includes understanding how AI tools (e.g. ChatGPT, DALL-E, Gemini) generate information, identifying the biases embedded in their design, and knowing how to critically use these tools. Data literacy extends this domain by emphasising the skills needed to interpret, evaluate, and ethically use quantitative and qualitative data, recognising its centrality in shaping narratives, informing research, and driving policy and decision-making (Baskara, 2025). Content creation

reflects the collaborative nature of digital environments, highlighting the importance of understanding multimodal communication, audience awareness, and the ethical responsibilities involved in producing and disseminating knowledge across platforms (Bondi & Cacchiani, 2021). These additions equip learners to understand how digital systems shape the information they encounter, thus reflecting a response to emerging technological and societal challenges, including the pervasive influence of algorithms, misinformation, and AI-generated content.

- **Adult and Professional Literacy** - Extending beyond tertiary education boundaries, this domain captures the broad range of literacies individuals need to navigate in their adult and professional lives. It includes financial literacy (such as the ability to manage personal and organisational finances, interpret economic information, and make informed financial decisions), and health literacy (such as understanding and applying health-related information to make sound personal and community health choices) (Alkema & Rean, 2013). Workplace communication is the ability to convey ideas clearly, collaborate effectively, and adapt communication styles to suit diverse professional contexts and audiences. Cross-cultural understanding supports individuals to work respectfully and effectively within diverse teams and globalised environments (Feekery, Condon & Witsel, 2025). Civic engagement and citizenship empowers individuals to participate in democratic processes, understand their rights and responsibilities, and contribute meaningfully, ethically and responsibly in physical and online communities (Clouesley, 2021). Lifelong learning involves the motivation and capacity to continually acquire new knowledge and skills in response to changing technologies, industries, and societal needs (Kumar, & Surendran, 2015). This domain recognises that literacy development does not end with graduation but continues throughout one's personal and professional life, enabling individuals to remain adaptable, informed, and engaged.

The revised model adds *Numeracy* explicitly to *Financial literacy*, and also adds *Interpersonal communication*, and *Emotional intelligence*. The inclusion of numeracy recognises that financial literacy extends beyond merely managing money; it is also about developing the ability to interpret numerical information, make informed decisions, and critically engage with data in personal and professional financial contexts. Interpersonal communication acknowledges the essential role of effective dialogue, collaboration, and relationship-building across social, academic, and workplace environments. Emotional intelligence has been incorporated to emphasise the importance of self-awareness, empathy, and emotional regulation, competencies increasingly valued in personal development and professional success (Feekery, Condon & Witsel, 2025). Together, these additions reflect a growing recognition that meaningful participation in contemporary society requires strong relational and reflective skills.

There are likely concepts missing from the model that could be added or amended over time. Users of the model can adapt and emphasise certain domains that are relevant for their disciplines and educational contexts. It is a living model that will continue to be refined as needed.

AI AS AN INFORMATION LITERACY CHALLENGE FOR LEARNING

The emergence of Gen-AI and its use within academic contexts saw the emergence of multiple conversations around the definition and framing of AI literacy. For the past two years, anecdotal stories from colleagues and numerous published blogs and papers, identify the challenge that teachers face in terms of knowing whether learners completed assessment on their own or if students cheated by having AI generate the work for them (Goodier, 2025; Gerritsen, 2024) and learners are bypassing the deep engagement with the research and writing process expected of tertiary learners (Aalai, 2025). In distance education, higher learner:staff ratios create challenges in building meaningful relationships with geographically distanced learners. Unless learners regularly attend synchronous online learning opportunities and engage in a range of other online activities educators design to foster connectedness and a sense of belonging (Kahu, 2021, 2024; Brown et al., 2022), we don't get to meet our learners and understand their capability and aspirations as learners in the same way we do with internal cohorts.

Gen-AI has invaded the IL space in ways we are still trying to understand. We know that it is changing and challenging the way learners engage with information searching, critical thinking and assessment completion. Concerns around learners' surface engagement with sources is not new: the Citation Project (Jamieson & Howard, 2013; Howard, Serviss, & Rodrigue, 2010) indicated learners typically demonstrate shallow engagement with sources, lacking synthesis and critical analysis. Many fail to effectively integrate source material into their writing, going through the motions of citing at a mechanical level, rather than effectively integrating and acknowledging the ideas of others in their work. But, at least they were citing real sources. Gen-AI has reshaped this information landscape with hallucinated or unverifiable sources and fabricated or misrepresented quotes peppering learner assessments. Claims are decontextualised and ideas presented without attribution to the information creator. The need for critical information evaluation skills is even more important now than in the past.

Generative AI has rapidly reshaped the ways learners engage with, produce, and evaluate information. However, while discussions of AI literacy often focus on prompt engineering or technical proficiency, there is a critical need to situate AI literacy as a subset of information literacy. The Information Literacy Spaces model offers a conceptual space where information literacy is recognised as holistic, relational, and contextually driven. Within this model, AI literacy fits naturally as a newly emerging, socially situated domain that interacts with ethical, sociocultural, affective, and evaluative dimensions of information engagement.

AI tools act as information intermediaries, generating content, responding to queries, and often replicating dominant worldviews. Therefore, learners must learn how to critically evaluate its outputs as part of their broader IL practice. Embedding AI literacy within the existing IL space acknowledges its entanglement with credibility, authority, and knowledge production, rather than treating it as an isolated skill set.

MAKING THE INFORMATION EVALUATION PROCESS EXPLICIT

Despite widespread acknowledgement of the importance of information evaluation, it is too often taught incidentally, or left implicit, in tertiary education (Badke, 2011, Feekery, 2013). Transitional learners entering tertiary study are particularly vulnerable to misinformation, disinformation, and the surface credibility of AI-generated content.

Much of the advice to educators around combating Gen-AI use in assessments centres on capturing the process rather than focusing on the product (Aalai, 2025). This is not a new approach: it is underpinned by constructivist pedagogy that Angela used in her doctoral study to embed IL development into the Environmental Planning discipline (Feekery, 2013). Yet this does not seem to be common practice: one of the main reasons learners may turn to Gen-AI is because assessment often over-emphasises the end product (e.g. a polished essay or report) rather than the intellectual journey that leads to it (Atkinson, 2024). Educators may avoid process-focused assessment for a number of reasons: the perceived increase in workload for both learners and staff; time restrictions for giving detailed feedback, particularly for large classes; knowing which type of feedback offers the most value; and concerns over whether the feedback is even read and actioned by the students (Paulson Gjerde, et al., 2017)

A key part of capturing the process is understanding ways students are engaging with information and evaluating its quality. Within this process, information evaluation should not be reduced to checklist compliance but framed as a reflective and relational process of knowledge engagement. Traditional evaluation tools like CRAAP (Currency, Relevance, Authority, Accuracy, Purpose) (Blackslee, 2004) and CARS (Credibility, Accuracy, Reasonableness, Support) (Harris, 2010) offer structured ways to assess information, but they reflect a linear, Euro-centric approach that can emphasise surface-level markers of quality like dates, URLs, author credentials, and reducing evaluation to verifying factual correctness or authority via publication format. These models also assume a universal definition of credible knowledge and treat information as objective and detached from its socio-cultural origins. Students need to shift from seeing information as a set of facts to verify towards understanding knowledge creation as a conversation that requires positioning, perspective and discernment (Feekery, 2013).

TE WHATU AHO RAU – HE ANGA AROTAKE: AN INFORMATION EVALUATION FRAMEWORK

Te Whatu Aho Rau – He Anga Arotake is a te ao Māori-informed information evaluation framework we co-developed in 2024. It builds on the earlier *Rauru Whakarare Evaluation Framework* (Feekery & Jeffrey, 2018), which was created as part of the *Information Literacy Spaces Project* to support learners' critical engagement with information. The updated framework centres Māori epistemologies and knowledge more explicitly to challenge the Euro-centric, linear logic that underpins common information evaluation tools. It offers a culturally sustaining model of engagement by centring the information evaluation process within Māori knowledge practices, particularly relevant in Aotearoa NZ classrooms, and a position that other indigenous knowledges can inform.

The name *Te Whatu Aho Rau* carries layered meaning. One interpretation references “the weaving of a hundred threads”, a metaphor for the way mātauranga (knowledge) emerges through the interweaving of perspectives, facts, experiences, and intuitions. Another interpretation refers to “the eye catching a hundred lights,” evoking the need to process, focus, and filter the overwhelming volume of information encountered in digital environments. The framework draws on this symbolism to support learners to trace whakapapa of ideas, make ethical and cultural connections, and pursue Māramatanga (clarity and understanding). It sees engaging with the information landscape as a humbling experience, as it should be when we look at whakapapa and understand we are only small parts of an immense ecosystem.

The design of the framework is both relational and holistic. It rejects the idea that evaluating information is a checklist task, and instead offers a model that flows between interconnected domains. It recognises that information is not neutral: it is created with intention, framed by context, and shaped by world views. It embeds ethical, relational, and contextualised thinking about information as learners engage with a range of information sources. It is grounded in mana, which in this context can briefly be described as the integrity, authority, and influence of people and knowledge. It requires and appreciates that all knowledge carries responsibilities for both creators and users.

Unlike checklist tools, *Te Whatu Aho Rau* does not isolate information features from their cultural or ethical contexts. It prompts learners to think relationally and critically, qualities that are especially vital in evaluating AI-generated information sources. Given that AI is now using its own generated information to produce responses (Rao, 2024), the need to trace the ideas to the original creators and subsequent users within specific contexts is even more important. The framework promotes critical AI engagement, moving beyond technical AI skills toward reflective and ethical AI use.

Engaging with *Te Whatu Aho Rau* offers learners the opportunity to significantly enhance their AI literacy and critical source evaluation skills, enabling them to recognise and resist misinformation and disinformation. Here's how each element of the framework can be aligned with specific pedagogical strategies to achieve these aims:

- **Pūtaketanga – Origin** - Pūtaketanga emphasises tracing and understanding the whakapapa, which we can describe as the origins and genealogy of knowledge, exploring who created the information, where and when it was created, for whom, and the authority it carries. It emphasises contextual and relational origins over author and date. Key considerations include determining the credibility and integrity of the information creator, understanding the socio-cultural and geographic context of where the ideas emerged, and identifying the intended audience and where the information was shared.

For AI-generated content, concerns centre on the misinformation and disinformation that can be amplified by Gen-AI in convincing and authoritative-sounding text. AI obscures the whakapapa of ideas, with ideas that seemingly appear from nowhere with no attributed authorship or verifiable context. Thus, learners must critically analyse any claims of authority. To combat this issue, learners need to be critical of the decontextualised, anonymous content. They can consider what data was likely used to train the AI and prompt the tool to reveal its sources and check the validity of the text it produces. More challenging is determining authorship of AI generated content: there are differing opinions around whether learners should be able to cite AI as author in line with citation practices of APA or other documentation styles.

- **Aronga – Lens, Perspective, Purpose** - Aronga explores both the information creator's and consumer's positionality, recognising that knowledge is shaped by context and world view, with true objectivity difficult to achieve. It challenges users to critically assess why the information was created, how it is shaped by bias or assumptions, and what agendas or intentions it may carry. Key considerations include identifying the information creator's purpose and potential bias, exploring the use of persuasive techniques and being aware

of our subjectivity and need for self-critical awareness as we interpret and present ideas captured in information sources.

This framework encourages learners to uncover the intent and bias of AI generated content, identify the rhetorical strategies used and consider any manipulative intent in the data training. Educators need to provide opportunities for learners to understand how biases present in AI training data influence the perspectives reflected in generated content which is presented as being neutral, universal, absolute, or any combination thereof. They need to question whose voices are amplified or silenced by AI, and how AI may reflect dominant cultural, political or epistemological perspectives. They must also self-reflect on how their own positionality, perspectives and experiences influence how they interpret AI-generated outputs.

- **Tātai Hononga – Connections** - Tātai hononga focuses on mapping how the information connects to other ideas, disciplines, communities, or lived experiences. It fosters engagement with multiple voices, especially those marginalised or silenced in dominant knowledge systems. Key considerations include determining the conversation the information contributes to, analysing the credibility of connections drawn between topics and sources, and finding ways to include and amplify underrepresented perspectives.

This is a powerful lens through which to challenge learners' passive acceptance of AI-generated outputs, especially when these draw from dominant cultural paradigms. Learners must verify AI outputs by cross-referencing the key ideas with those found in scholarly, professional and community sources to see whether the ideas align with credible, verified sources or stand apart without support. They need to be aware that AI can falsely link ideas across texts because it decontextualises ideas from their source.

- **Māramatanga – Understanding** - Māramatanga refers to enlightenment or how understanding develops through engagement with quality information. This aspect considers whether the information adds value to a topic, is relevant and accurate, and prompts further inquiry and impact beyond academia. Key considerations include determining the usability and clarity of the information and understanding how it contributes to the body of community or professional knowledge, and how it can be used for their specific context and audience as information creators. It also connects to how the information deepens or challenges our existing understandings of the topic or issue. This dimension supports learners to move from information consumption to knowledge creation.

Māramatanga invites learners to evaluate whether AI-generated content meaningfully contributes to their understanding of a topic and whether it promotes genuine insight or simply offers generic summaries. While Gen-AI tools can produce confident-sounding responses, learners must assess whether the output demonstrates depth, originality, and relevance to their inquiry or context. Māramatanga encourages users to distinguish between surface-level text generation and substantive knowledge that adds value, challenges assumptions, or provokes further exploration. Learners must reflect on how AI-

generated outputs shape their own meaning-making and whether these outputs deepen understanding or not.

USING TE WHATU AHO RAU IN PRACTICE

Requiring learners to engage with Te Whatu Aho Rau, or a similar model grounded in locally-situated indigenous ways of knowing, will support learners to build essential information evaluations skills and become effective creators and consumers of information. Te Whatu Aho Rau has immediate application in classroom and assessment practice. It can be used as a scaffold for learner reflections on how they found, chose, and used sources. It can be used as a tool to evaluate the credibility and utility of AI-generated content. For educators, capturing students' information evaluation process in meaningful ways can be embedded into assessment and reflective learning tasks (Feekery et al., 2021). It can be used to develop assessment criteria that explicitly reward critical and contextual information engagement. If both educators and learners engage with the framework, they can create a shared language when they talk about how knowledge is built, shared, and used.

When embedded into learning activities, the framework not only supports academic integrity but also fosters deeper learning. Learners become more aware of their responsibilities as knowledge users and creators. They begin to understand that information is not just something to be consumed or cited, but it rather ideas to engage with and conversations to join.

CONCLUSION

In today's tertiary learning environment, where AI-generated content increasingly shapes how learners access and engage with information, the need for holistic, critical, and culturally grounded information literacy is more urgent than ever. We take the position that IL must be treated as central to academic engagement, not as an add-on, nor as a skill that develops incidentally. Holistic IL models, including the revised Information Literacy Spaces model advocate for embedding IL within disciplinary learning and for recognising the broader sociocultural, ethical, and emotional dimensions of engaging with information. This framing is essential if learners are to develop the evaluative and critical capabilities needed to navigate increasingly complex digital information landscapes, increasingly being shaped by AI-generated content.

This paper has positioned AI literacy as an integral part of the broader information literacy space, and argued for more intentional and embedded approaches to information evaluation in both curriculum and assessment. As learners face the challenges of hallucinated sources, fabricated citations, and decontextualised outputs, they need explicit opportunities to critically assess where information comes from, whose voices are present or missing, and how knowledge is constructed and communicated.

The revised Information Literacy Spaces model reflects this shift, integrating AI literacy into a wider network of literacies that support learner learning and ethical information engagement. Alongside the revised IL model, Te Whatu Aho Rau – He Anga Arotake offers a relational, culturally grounded framework that supports deeper engagement with information. Based from a te ao Māori way of knowing, this model offers educators and learners a meaningful way to engage with information evaluation as an iterative, reflective, and contextually anchored process that supports us to make sense of information in the age of Gen-AI.

Embedding an holistic evaluation framework into learning tasks helps shift the focus from product to process, supporting learners to reflect critically on the origins, purposes, and connections within the information they engage with. In doing so, we can foster deeper learning, strengthen academic integrity, and empower learners to take greater responsibility for how they use and create knowledge in complex and uncertain information environments, competencies that are essential in the Gen-AI era and the continually evolving information landscape.

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- Angela Feekery: Conceptualization, Resources, formal analysis, writing—original draft preparation, writing—review and editing
- Reupena Tawhai: Conceptualization, Resources, Writing—review and editing.

All authors have read and agreed to the published version of the manuscript

Sustainable Development Goals (SDGs)

This study is linked to the following SDG(s): Quality education (SDG 4) and Reduced inequalities (SDG 10)

Authors' Notes

This paper draws on Angela's research, extending from her earlier doctoral research and subsequent work in the Information Literacy Spaces Project (2016–2019), a collaborative research initiative that brought together tertiary teachers and librarians to support learners to become information literate learners. Two key outputs from this project were the Information Literacy Spaces Model (Feekery, 2016) and the Rauru Whakarare Evaluation Framework (Feekery & Jeffrey, 2019). In 2025, Angela revised the Information Literacy Model to incorporate AI literacy and collaborated with Reupena to reimagine the evaluation framework, resulting in Te Whatu Aho Rau – He Anga Arotake.

Generative AI Statement

Drawing on Bozkurt's (2024) framework, AI assistance was used in the following ways during the production of this paper:

1. General Assistance: The authors acknowledge the use of ChatGPT5 Project (2025) in suggesting alternative wording for work previously published by the authors to mitigate the risk of self-plagiarism. All contributions from the AI were reviewed, critically edited, and validated by the human authors to ensure academic rigor and adherence to ethical standards. The final content, conclusions, and assertions in this paper are the sole responsibility of the human authors.
2. Idea Development: Ideas regarding ways the IL Framework and Te Whatu Aho Rau evaluation framework could be used to support students AI literacy development were

explored using by ChatGPT5 Project (2025) alongside engaging with sources. The final ideas and frameworks presented are the responsibility of the human authors.

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Enhancing Education through Resource Sharing in the European University Model: The Case of Cybersecurity and Beyond

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ABSTRACT

The European University for Customized Education (EUNICE) brings together ten public universities to operate a shared, inter university learning environment that is inclusive, scalable, and sustainable. EUNICE pools specialized teaching infrastructures and makes them remotely accessible, allowing students and staff to participate in market relevant, interdisciplinary curricula regardless of location. Cybersecurity is a flagship use case that illustrates how resource sharing improves quality and reach, but the same framework supports a broad range of disciplines.

At the core of this approach is the EUNICE Virtual Lab—a distributed digital ecosystem that orchestrates remote, hands-on activities. Built on the Espresso Labs platform, it provides cloud mediated access to physical and virtual devices for interactive, real-world experimentation. By removing infrastructure and cost barriers, the Virtual Lab widens participation in practice intensive courses and strengthens resilience and accessibility across European regions.

This paper details the technical architecture, governance, and pedagogical design; presents representative cybersecurity and non-cybersecurity course scenarios; and discusses operational metrics, quality assurance, and learner/teacher feedback. We distil lessons learned on interoperability, security, and sustainability, and outline a roadmap for scaling to additional domains, partners, and lifelong learning pathways.

Keywords

European universities; transnational higher education; virtual labs; remote laboratories; cybersecurity education; student-centred learning; hybrid mobility; micro-credentials

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INTRODUCTION

Global higher education is shifting quickly. Learner mobility, accelerating digital transformation, and the demands of lifelong, interdisciplinary study require models that are inclusive, scalable, and resilient. The European University initiative—and the EUNICE Alliance (European University for Customized Education) in particular—answers this need by enabling a distributed, collaborative, and student-centred approach to teaching and learning across borders.

This paper is guided by the Māori principle of *ako*, which understands teaching and learning as a reciprocal, relational process in which knowledge is co constructed and participants are simultaneously learners and teachers (Alton-Lee, 2003; Royal Tangaere, 1997; Pere, 1988, 1994). Applied to transnational higher education, *ako* shifts attention from transactional delivery to collaboration, shared responsibility, and intercultural dialogue.

In practice, EUNICE aligns with the *ako* model in several ways:

- Co-development of curricula across institutions, enabling educators and students to construct knowledge together.
- Hybrid mobility and shared virtual laboratories, supporting equitable participation across socioeconomic and geographic contexts.
- Student centred learning environments that empower learners to chart their educational pathways actively and autonomously.
- Cross cultural collaborative problem solving, cultivating empathy, reflection, and global citizenship.

Framing our analysis within the conference’s four dimensions we show how EUNICE operationalizes reciprocal teaching and learning while identifying where the indigeneity dimension can be strengthened. We examine the EUNICE model through the lens of *ako*, showing how it advances accessibility, pedagogical innovation, and institutional resilience. Drawing on case studies in cybersecurity education, modular learning design, and international academic cooperation—for example with the University of Mons (UMONS) and the University of Electro Communications, Tokyo (UEC)—we illustrate how reciprocal learning relationships are enacted within a digitally enabled, multi-institutional ecosystem.

The article first outlines EUNICE’s strategic vision and its alignment with European education policy. It then analyses the alliance’s digital infrastructure, pedagogical design, and implementation challenges. We conclude by proposing EUNICE as a blueprint for inclusive, collaborative futures in global higher education and by distilling actionable lessons for Alliances seeking scalable, sustainable, and culturally responsive models.

THE EUNICE MODEL AND ITS STRATEGIC VISION

The European University for Customized Education (EUNICE) is a flagship alliance within the European Universities program — a policy-driven, cross-border initiative of the European Commission that

fosters deeper integration, cooperation, and innovation in European higher education. Established in 2020, EUNICE unites ten public universities across Europe (Fig. 1), creating a networked ecosystem in which students, educators, and researchers operate within shared digital and physical environments.

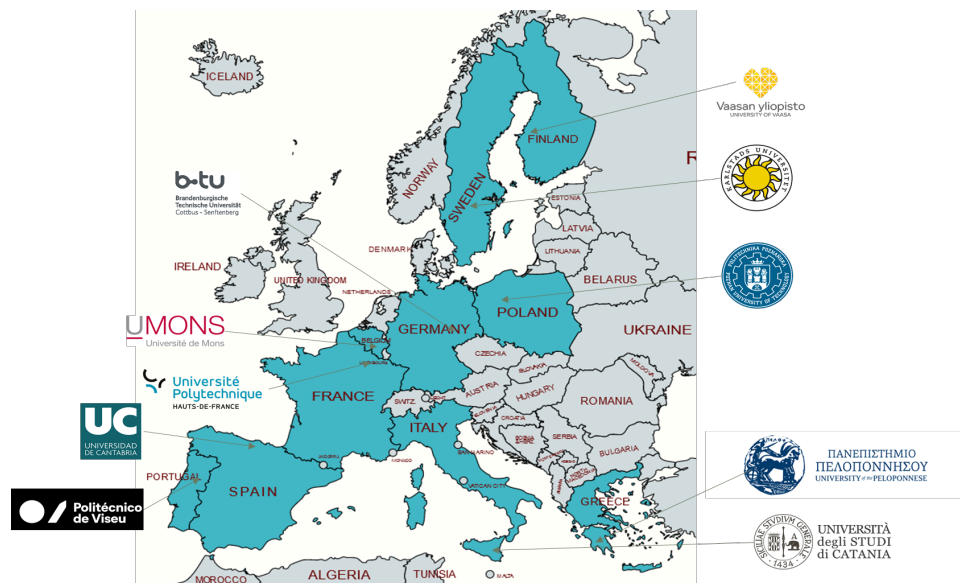


Figure 3. Geographical spread of the EUNICE alliance. Locations of the ten partner public universities across Europe (established in 2020), illustrating the alliance’s transnational coverage and regional diversity

At its core, EUNICE is committed to customized education (Fig. 2): the flexible adaptation of learning pathways to individual needs, professional aspirations, and regional labor market demands. In contrast to one-size-fits-all curricula, the model encourages modularity, interdisciplinarity, and international collaboration in both teaching and research

Strategic Objectives

1. Educational flexibility and personalization
Learners choose from online and blended modules—including micro-credentials and multidisciplinary courses—often co-developed by multiple partners, enabling pathways aligned with prior knowledge, interests, and career goals.
2. Resource sharing across borders
The alliance pools infrastructure such as cloud-based laboratory platforms (e.g., Espresso Labs), collaborative teaching resources, and federated digital campuses. This reduces redundancy and widens access, particularly for resource constrained institutions.
3. Mobility by design
Mobility is conceived as a hybrid, inclusive experience that integrates virtual mobility (online courses, telepresence), short physical exchanges (summer schools, workshops), and embedded internships or research stays, broadening participation in internationalization.
4. Sustainability and resilience
Through shared governance and digital infrastructures, EUNICE supports resilient education systems able to adapt to crises—pandemics, conflict, or climate disruptions—and promotes open, reusable learning materials for long-term sustainability.

5. Civic engagement and social innovation

The framework links universities with societal challenges, encouraging socially responsible innovation through collaborative, international, project-based learning.

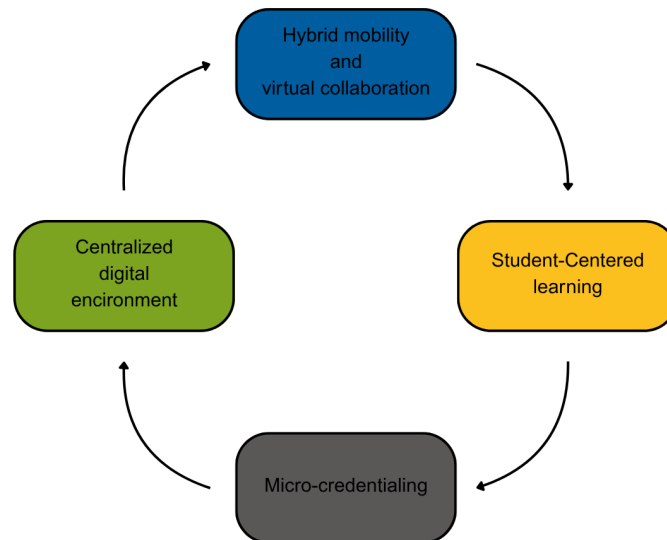


Figure 2. EUNICE approach to customized education. © The Authors.

Alignment With EU Education Policy

EUNICE aligns with the priorities of the European Education Area (EEA) and the Digital Education Action Plan (2021–2027), notably in cross border collaboration, inclusive and digital learning environments, and lifelong skills development. It also anticipates directions identified in the Strategic framework for European cooperation in education and training towards the European Education Area and beyond (European Commission, 2021), which calls for integrated, student-centred, and interoperable university networks. Moreover, EUNICE’s learner-centred, personalized pathways align with the U.S. National Educational Technology Plan (U.S. Department of Education, 2024), which prioritizes placing students’ needs, expectations, and talents at the centre of learning and leveraging technology to tailor instruction.

EUNICE is therefore not merely an administrative alliance; it constitutes an operational transformation of the university experience that advances equity, openness, and pedagogical innovation across Europe (Fig. 3). This strategic vision underpins the remainder of the article, which examines the alliance’s digital infrastructure, case studies, pedagogical foundations, and directions for future research.



Figure 3. EUNICE pillars © The Authors.

DIGITAL INFRASTRUCTURE: ESPRESSO LABS AND VIRTUAL COLLABORATION

Digital infrastructure underpins the EUNICE model, enabling scalable, resilient, and inclusive access to practice-based education across borders. At its core is Espresso Labs—a cloud-based remote laboratory environment that allows students to perform hands-on experiments on both physical and virtual devices from any location with an internet connection. This solution reflects EUNICE’s broader commitment to lowering barriers to technical education through shared resources and remote collaboration tools.

What is Espresso Labs?

Espresso Labs (2025) virtualizes access to physical laboratory equipment via the cloud. Designed with accessibility and interoperability in mind, it integrates:

- Remote access to real devices (e.g., IoT boards, sensors, networked hardware).
- Virtual machines and emulated systems for cybersecurity testing and application development.
- A central management interface for scheduling, usage monitoring, and assignment tracking.
- Support for version control and collaborative coding environments.
- Integration with learning platforms (e.g., Moodle, Microsoft Teams) for a seamless user experience.

This approach is particularly valuable in disciplines such as cybersecurity, electrical engineering, and data science, where infrastructure is costly, institution specific, and difficult to scale.

Learning By Doing – At a Distance

By enabling remote access to physical labs, Espresso Labs removes common obstacles such as limited lab availability, high equipment costs, and geographical constraints. It also:

- Supports project-based learning through shared access to development boards and network topologies;
- Enables simulation led design combined with physical deployment and testing;

- Allows asynchronous experimentation, with on demand booking of lab resources;
- Encourages peer collaboration and distributed teamwork, which are central to EUNICE's pedagogical design.

Students from partner universities can run experiments on identical hardware, compare results, and debug systems together in real time—often using telepresence tools, screen sharing, or integrated webcams and IoT camera feeds.

Resilience and Scalability of the Infrastructure

From an institutional perspective, Espresso Labs exemplifies a resilient, scalable solution:

- It can be deployed across universities using containerized microservices, enabling local customization with global integration.
- The platform architecture supports load balancing and secure VPN tunnels to protect data integrity and privacy during remote access.
- High availability configurations and failover clusters sustain service under peak demand, including periods of remote only teaching.

Consequently, Espresso Labs is a cornerstone of EUNICE's response to both planned and emergency remote education scenarios.

Pedagogical Affordances

Espresso Labs is not only a technical platform; it also enables pedagogical innovation. It aligns with:

- Constructivist principles, promoting hands on learning and experimentation;
- Student centered approaches (European Commission, 2021; U.S. Dept. of Education, 2024), enabling learners to explore, test, and reflect independently;
- The Community of Inquiry framework, supporting cognitive, teaching, and social presence through collaborative virtual labs.

Blending theoretical instruction with practical experience—even remotely—has proved particularly effective in complex domains such as cybersecurity, where concepts must be demonstrated in real world conditions.

Integration With Other EUNICE Tools

Espresso Labs is fully integrated within the EUNICE Virtual Campus, enabling:

- Single sign on (SSO) for students from any partner institution;
- Embedded laboratory activities within course modules;
- Real time monitoring of progress and performance;
- Compatibility with micro credential frameworks, including automatic issuance of digital badges or certificates upon completion.

Espresso Labs is a key enabler of EUNICE's educational vision: an inclusive, resilient, and practice oriented digital infrastructure. By advancing Innovation & Openness and strengthening Accessibility & Resilience, it democratizes access to technical education and fosters meaningful collaboration between institutions and learners, regardless of location, while offering a model that can scale with pedagogical ambition and technical complexity.

CASE STUDY: IOT SECURITY COURSE

An illustrative example of how EUNICE translates its digital and pedagogical vision into practice is the joint IoT Security course co delivered by Poznan University of Technology (PUT) and the University of Mons (UMONS). The course models international, interdisciplinary learning in a hybrid format, combining short-term physical mobility, sustained remote collaboration, and shared digital infrastructure such as Espresso Labs.

Course Objectives and Structure

The course responds to growing demand for cybersecurity skills in the Internet of Things (IoT). Students from PUT and UMONS are organized into binational teams tasked with designing, developing, and securing small scale IoT systems.

The course unfolds in three phases:

1. Kick-off and in person module (Poland)

UMONS students travel to Poznan for an intensive one-week session that includes lectures, practical workshops, and team formation. Teams begin projects that capture, transmit, and visualize sensor data within security critical architectures.

2. Remote development phase (six weeks)

After returning to their home institutions, teams collaborate using:

- a. Espresso Labs for remote access to IoT testbeds;
- b. Shared development environments (e.g., GitHub, cloud IDEs);
- c. Weekly online meetings and mentoring;
- d. VPN access to PUT's Cybersecurity Lab for penetration testing and data analysis.

3. Final session and presentations (Belgium)

PUT students travel to UMONS. Teams present outcomes to a joint academic–industry panel, demonstrating technical results alongside collaborative workflow, problem solving strategies, and security design thinking.

Pedagogical Innovation

The course exemplifies constructivist, student-centred pedagogy through:

- Active, project-based learning in an international context;
- Real world challenges aligned with contemporary cybersecurity threats;
- Blended mobility that combines physical immersion with sustained remote collaboration;
- Peer mentoring and intercultural teamwork, reinforcing shared responsibility.

Emphasis on practical design, prototyping, and testing in hybrid settings develops technical depth and transversal skills simultaneously. This enactment of reciprocal, collaborative learning directly reflects the Māori concept of ako.

Outcomes And Feedback

Student evaluations highlight:

- Increased motivation driven by international teamwork and authentic applications.
- Deeper understanding of IoT architectures and cybersecurity vulnerabilities.
- Improved communication, version control, time management, and intercultural collaboration.

To date, over 100 students have participated in three editions of the program, with over 90% expressing great satisfaction with the course. In addition, all students pointed to the important element of intercultural cooperation and the opportunity to develop not only technical but also interpersonal skills. Educators report gains in co-teaching, curriculum integration, and institutional knowledge sharing. Industry panellists value the market readiness of prototypes and the alignment with sector needs.

Strategic Implications For EUNICE

The course demonstrates how EUNICE can:

- Embed hybrid, modular learning experiences within regular curricula;
- Facilitate cross campus course design and delivery;
- Scale shared, practice intensive experiences without duplicating infrastructure;
- Strengthen internationalization at home for students unable to undertake full semester mobility.

The course's success has informed new EUNICE initiatives, including modular micro-credential programmes, joint master's pathways, and collaborative doctoral mentoring.

STUDENT-CENTERED LEARNING: THEORY AND PRACTICE

Central to the pedagogical framework of the EUNICE alliance is the principle of student-centred learning (SCL) — an educational paradigm that places the learner at the heart of the teaching process. Rather than being passive recipients of information, students become active participants and co-creators of their own educational journey. This approach aligns closely with constructivist theories of learning and reflects broader efforts across Europe to promote personalization, inclusivity, and agency in higher education.

Implementation In EUNICE

The EUNICE model operationalizes SCL through (European Commission (2021), U.S. Department of Education (2024), Kerimbayer et al. (2023), Gudoniene et al. (2025):

- Customized learning pathways: Students can select courses and modules across partner universities, including micro-credentials and interdisciplinary offerings;
- Flexible pacing and modality: The combination of asynchronous resources, recorded lectures, and synchronous mentorship allows students to manage their time and workload;
- Project-based learning: Courses such as the IoT Security programme emphasize practical, team-based challenges, mirroring professional contexts;

- Digital learning environments: Platforms such as the EUNICE Virtual Campus provide a “single point of access” to materials, labs, support, and assessment — centralizing resources while allowing flexible navigation;
- Collaborative mentorship and peer learning: Students interact with tutors, international peers, and even doctoral mentors across borders, increasing cognitive presence and motivation.

Benefits for Learners

Student-centred approaches within EUNICE promote:

- Autonomy and ownership: Learners define their goals and co-design their study paths, which enhances self-efficacy and responsibility.
- Relevance and engagement: Courses respond to students’ personal and professional interests, leading to higher motivation and persistence.
- Interdisciplinary and intercultural skills: Working in diverse, international teams builds adaptability, empathy, and global competence.
- Digital fluency and self-regulation: Managing learning across tools and institutions fosters metacognition and lifelong learning habits.

This aligns directly with European Commission goals for resilient, future-oriented education (European Education Area, 2023), especially in supporting non-traditional learners, working students, and those facing geographic or financial barriers.

Challenges and Support Mechanisms

While student-centred learning offers many benefits, it also presents challenges:

- Self-regulation: Not all students are immediately prepared to manage flexible, autonomous study. EUNICE addresses this through integrated mentoring and support systems.
- Digital divide: Access to stable internet, hardware, and technical literacy can limit full participation. Institutions work to minimize these gaps via VPNs, mobile-accessible platforms, and hybrid infrastructure.
- Motivation and community: Online and hybrid learners may feel isolated. EUNICE emphasizes community-building through synchronous sessions, collaborative projects, and physical mobility components (e.g., summer schools).
- Assessment design: Traditional exams may not fully capture progress in personalized pathways. Alternative assessments, including portfolios, digital badges, and team deliverables, are deployed to evidence learning outcomes and competencies.

CENTRALISED DIGITAL ENVIRONMENT FOR ACCESSIBILITY AND RESILIENCE

A critical enabler of scalable, inclusive, and student-centred education within the EUNICE model is the centralization of access to learning environments. Digital transformation in higher education has given rise to integrated platforms that manage learning processes, communication, assessment, and student support in a unified interface. In EUNICE, this centralized infrastructure plays a foundational role in connecting learners and educators across borders, disciplines, and institutions.

The Need for Centralization in Transnational Education

In a multi-institutional context like EUNICE—spanning ten public universities across Europe—fragmentation poses a serious risk to learning continuity and user experience. Without a unified system, students may face:

- Multiple logins and platform interfaces;
- Inconsistent communication and deadlines;
- Difficulty tracking learning progress and accessing resources;
- Limited visibility into their learning journey across institutions.

A centralized digital environment addresses these issues by offering a “single point of access”, ensuring that students and educators can engage with the full spectrum of learning tools and data within a coherent digital ecosystem.

EUNICE Virtual Campus and Integrated Tools

The EUNICE Virtual Campus provides an exemplar of such integration. It combines learning management systems (LMS), virtual labs, collaborative tools, scheduling platforms, and assessment interfaces. Key functionalities include:

- Unified login (Single Sign-On (SSO)) via eduGAIN (GÉANT Association, n.d.) and cross-institutional account synchronization.
- Course catalogues with module descriptions, availability, language, and prerequisites.
- Embedded access to resources, including recorded lectures, e-books, and remote lab portals (e.g., Espresso Labs).
- Messaging and notifications to keep students updated on course activities and announcements.
- Integrated grading systems, allowing instructors from multiple universities to assess student work in shared courses.
- Progress dashboards that allow students to track their achievements, completed modules, and earned micro-credentials.

This infrastructure also aligns with student-centred learning paradigms by making digital environments responsive to learner autonomy and flexibility.

Equity, Accessibility and Monitoring

Centralized platforms contribute to equity and accessibility by:

- Reducing technical complexity for non-traditional learners and students with lower digital literacy;
- Providing built-in accessibility features (e.g., WCAG-compliant design, text-to-speech, captioned videos);
- Offering multilingual interfaces and language support tools;
- Enabling data-driven interventions for at-risk students through analytics and early warning systems.

Moreover, centralized systems allow institutions to track learning outcomes at the macro level — supporting quality assurance, accreditation, and continuous improvement.

Interoperability and Strategic Vision

The EUNICE platform architecture is designed for interoperability across diverse institutional systems. This includes:

- Support for common standards (e.g., SCORM, LTI, xAPI);
- APIs and middleware for connecting different university databases;
- Secure authentication and privacy protocols, aligned with GDPR regulations.

In this way, the centralized digital environment not only supports teaching and learning, but also strengthens policy coherence, digital sovereignty, and strategic alignment across the alliance.

Accessibility and resilience are two foundational pillars of inclusive and future-proof higher education. Within the EUNICE framework, these concepts are operationalized through digital openness, modular learning opportunities, and scalable delivery modes that respond to diverse learner needs and crisis situations. The aim is not only to expand who can access education, but also to ensure that learning continues effectively despite disruptions—whether social, geopolitical, or technological.

Accessibility Features and Equity

In line with the European Education Area (EEA) goals and the ethos of the “Ako” principle of reciprocal learning, accessibility in EUNICE refers to the removal of barriers for:

- Students from underserved regions,
- Learners with physical, cognitive, or technological limitations,
- Working students and lifelong learners,
- Individuals with limited language or mobility options.

EUNICE addresses these barriers by offering:

- Remote access to labs and classes, reducing dependency on physical presence,
- Multilingual materials and automated translation tools,
- Digital interfaces built on accessibility standards (e.g., WCAG-compliance),
- Flexible and asynchronous formats, supporting learners in different time zones and life circumstances.

In many of the courses offered by EUNICE, students can engage in high-level technical training regardless of their location or socioeconomic background.

Hybrid Mobility and Flexible Learning Paths

One of the most effective accessibility mechanisms in EUNICE is the promotion of hybrid mobility — short-term physical exchanges (such as week-long workshops or summer schools) paired with extensive online collaboration and instruction. This allows students who cannot commit to full-semester exchanges to still benefit from:

- Intercultural learning.
- International networking.
- Access to specialized infrastructure (e.g. Espresso Labs).

These flexible paths also empower students to personalize their curriculum, choosing modules, skills, and micro-credentials that align with their goals and constraints.

Resilience and Continuity

The COVID-19 pandemic was a stress test for global education systems, exposing vulnerabilities in traditional models that rely heavily on in-person, time-fixed instruction. In contrast, EUNICE demonstrated institutional resilience through:

- Rapid digitization of teaching, supported by shared infrastructure and cloud-based tools;
- Continuation of practical instruction via remote labs;
- Strengthened partnerships across institutions that enabled the pooling of content, staff, and expertise;
- Student wellbeing initiatives, including remote mentoring and academic support.

These experiences shaped EUNICE's design principles, ensuring that the model remains robust against future crises — be they health-related, geopolitical, or environmental. They also reinforce the alliance's commitment to continuous improvement and evidence-based adaptation.

INNOVATION AND OPENNESS THROUGH SHARED PLATFORMS

Innovation and openness are key drivers of systemic transformation in transnational higher education. In the EUNICE alliance, these principles are embedded in the architecture of teaching, collaboration, and digital infrastructure. Through shared platforms, interoperable systems, and federated identity access, EUNICE demonstrates how technology can expand inclusivity, reduce costs, and increase sustainability — all while maintaining institutional autonomy and academic quality. This approach also reflects the Māori concept of *ako* and advances the conference dimensions of Innovation & Openness and Accessibility & Resilience.

Technological Innovation as a Pedagogical Enabler

EUNICE embraces innovation not as an end in itself but as a tool to facilitate:

- Cross-institutional learning pathways;
- Modular course design and micro-credentialing;
- Access to immersive laboratories and real-time collaboration;
- Streamlined integration of administrative and academic processes.

The use of Espresso Labs, remote lab environments, and synchronized Moodle instances are concrete examples of how EUNICE innovates in both pedagogy and infrastructure to serve diverse learner needs.

Moodle-Based Platform and Federated Access

One of the cornerstones of EUNICE's digital ecosystem is its Moodle-based learning environment, which is extended to all partner institutions while maintaining seamless user experience through federated access via eduGAIN.

Key features include:

- Single Sign-On (SSO) using institutional credentials from home universities.
- Secure authentication via eduGAIN, an international federation service that connects identity systems across higher education institutions.
- Role-based permissions that ensure faculty and students maintain consistent access across courses, institutions, and projects.

- Shared repositories of learning objects, course modules, video content, and assessments.

This approach reflects a shift away from isolated institutional silos and toward platform openness, allowing partners to co-create, reuse, and scale high-quality educational resources without duplicating infrastructure.

The Open Course Ecosystem

EUNICE also supports an open course ecosystem where students and educators can:

- Access common course catalogues, filterable by topic, language, university, or credit format;
- Enrol in micro-credential programmes and hybrid mobility modules offered by any partner institution;
- Earn digital badges and certificates that are recognized across the alliance and increasingly linked to ECTS-compatible formats.

Courses are designed to be modular, often offered asynchronously or with hybrid engagement, making them accessible to both full-time students and lifelong learners. This structure aligns with European Commission recommendations on open education practices and sustainable digital learning models.

Moreover, the platform supports innovation in assessment, including collaborative evaluations, peer feedback, digital portfolios, and learning analytics. These tools help faculty personalize feedback and support continuous improvement.

Benefits and Strategic Implications

By adopting shared platforms and open innovation practices, EUNICE achieves:

- Scalability: Infrastructure and content can support growing student numbers without proportional cost increases.
- Cost-efficiency: Reduces duplication of systems and materials, leveraging shared investments.
- Interoperability: Enhances cooperation between diverse institutional systems.
- Sustainability: Supports low-carbon models of education through reduced travel, digital content sharing, and flexible delivery.

Together, these outcomes illustrate how openness and collaboration can be operationalized at scale without compromising quality or institutional autonomy.

POLICY, QUALITY AND MULTI-INSTITUTIONAL ALIGNMENT

In a transnational educational environment like EUNICE, the effectiveness of collaboration depends not only on technology or pedagogy but also on coherent policies, quality assurance, and institutional alignment. The challenge is to ensure that students moving between universities — physically or virtually — experience academic consistency, transparent recognition of learning outcomes, and a high level of educational quality across the alliance. EUNICE addresses this challenge through structured policy coordination, shared frameworks, and joint recognition mechanisms.

The Need for Cross-Institutional Policy Alignment

As an alliance of ten European public universities, EUNICE spans multiple national systems, each with its own regulatory and accreditation structures. To overcome fragmentation, the alliance has initiated:

- Joint governance structures, including a policy and academic board with representatives from each institution, and
- Standardized academic calendars and module formats, facilitating student mobility and joint course delivery.

These mechanisms ensure that policies are not merely coexisting but actively aligned to promote inclusive and seamless student experiences.

Shared Accreditation and Multinational Degree Initiatives

EUNICE has also begun work on joint and multiple-degree programmes, especially in areas such as cybersecurity and engineering. These initiatives include:

- Harmonized curricula across at least three universities,
- Joint supervision and teaching models,
- Shared diploma supplements indicating the international nature of the programme,
- Exploration of European Degree Label piloting, aligned with European Commission guidelines,
- Roadmaps for recognition by national authorities and professional bodies to ensure labour-market relevance across the European Union.

Such programmes are designed to facilitate recognition by national education authorities, accreditation bodies, and employers across the EU – reinforcing quality, transparency, and portability of learning outcomes across the alliance.

MODULAR MICRO-CREDENTIALING AND THE INTENSIVE INTERNATIONAL EDUCATION PROGRAMS (IIEP) INITIATIVE

The demand for flexible, skill-oriented, and internationally recognized learning formats has never been greater. In response, the EUNICE alliance and its member institutions — including Poznan University of Technology — are actively implementing modular micro-credential strategies that align with emerging European standards. A flagship initiative in this area is the Intensive International Education Programs, which reflect the universities commitment to personalized, scalable, and industry-relevant education. Moreover, this strategy resonates with Māori concept of ako.

The Rationale Behind Modular Learning

The traditional “one-size-fits-all” degree model often fails to accommodate diverse learner profiles, particularly in fields that evolve rapidly such as Artificial Intelligence (AI), Cybersecurity, and ICT. The IIEP approach addresses this by offering:

- Modularization of content into discrete, focused learning units.
- Flexible pathways, where students can select and sequence modules based on their interests and career goals.
- Stackable micro-credentials, which can build toward full qualifications or stand alone as professional upskilling tools.
- Open access to learners beyond the standard degree population, including professionals and international students.

This aligns with European Commission policy trends promoting individual learning accounts and portable credentials to support lifelong learning and labour market mobility.

Structure and Format of IIEP

Each IIEP consists of a series of interconnected modules designed for international delivery in hybrid formats. These programmes focus on three high-demand areas:

- AI and Machine Learning
- Cybersecurity
- ICT and Digital Infrastructure

Courses typically include:

- Pre-recorded lectures with accessibility features (e.g., WCAG-compliance, subtitles).
- Interactive learning materials hosted on the central Moodle platform.
- Live consultation sessions with instructors and teaching assistants.
- Hands-on virtual labs, with access to remote infrastructure (e.g., Espresso Labs).
- Physical summer schools or intensive in-person components to facilitate immersion and community building.

Each module concludes with an assessment and micro-credential issuance, including ECTS allocation and digital certification.

Customization and Student Autonomy

The IIEP design is explicitly student-centred. Students can:

- Choose any combination of modules, building personalized “learning stacks”,
- Decide when and how to participate, synchronously or asynchronously,
- Focus on specific thematic clusters or blend across topics (e.g., linking AI ethics with cybersecurity fundamentals).

For instance, in the cybersecurity track, 10-hour modules include:

- CYB01 – Introduction to Cybersecurity in the New Era
- CYB02 – Cybersecurity in a Hyper-Connected World
- CYB03 – Introduction to Quantum Computing
- CYB04 – Cybersecurity in a Post-Quantum World
- CYB05 – Designing and Operating a SOC
- CYB06 – Identity and Access Management (IAM) and AAA Policies
- CYB07 – Web Application Security
- CYB08 – Risk Management and Security Policy
- CYB09 – Digital Forensics

This modularity supports students with different prior knowledge levels, professional goals, and availability, ensuring education is both inclusive and tailored and it provides clear pathways to stack learning toward larger qualifications.

Addressing Strategic Challenges in Higher Education

The IIEP initiative also tackles several structural challenges facing international education:

- Drop-out prevention: Modular flexibility allows learners to continue studies despite life disruptions.
- Competency gaps: Students with uneven prior education can fill specific knowledge deficits through targeted modules.
- Internationalization: By offering hybrid access and multilingual support, IIEP attracts students from across the EU and beyond.
- Low visibility of educational offerings: By curating and branding modules around relevant themes, institutions improve outreach to prospective international learners.
- Quality assurance: Shared rubrics and peer review ensure consistency of outcomes across institutions.

Recognition, Quality and Industry Relevance

Micro-credentials earned through the IIEP are:

- Aligned with ECTS and EQF standards, enabling easy integration into broader qualifications;
- Digitally certified, ensuring tamper-proof portability;
- Increasing co-designed with industry partners, embedding real-world project work and mentor-supported learning to strengthen employability outcomes.

In future iterations, modules are expected to integrate real-world project work in collaboration with industrial stakeholders and mentor-supported learning to strengthen employability outcomes with impact indicators (e.g. job placement, skill uptake) systematically monitored.

The IIEP initiative represents a scalable and customizable model for delivering high-quality, skill-focused education across borders. By integrating modularity, digital access, and international collaboration, it exemplifies how micro-credentials can support the strategic goals of inclusivity, lifelong learning, and workforce alignment within the EUNICE alliance and beyond.

CONCLUSION: EUNICE AS A SCALABLE MODEL FOR GLOBAL HIGHER EDUCATION FUTURES

As global higher education systems grapple with the dual imperatives of inclusivity and innovation, the European University for Customized Education (EUNICE) emerges as a pioneering model that responds to some of the most pressing educational challenges of the 21st century. Through its focus on resource sharing, student-centred pedagogy, digital infrastructure, and intercultural collaboration, EUNICE demonstrates how higher education can be reimagined as a flexible, resilient, and scalable ecosystem.

Rather than simply digitizing old models, EUNICE redefines what higher education can be: inclusive by design, global in scope, resilient in function, data-informed in practice, and reciprocal in spirit — a direct expression of the Māori principle of *ako*. At the same time, the alliance recognises the need to deepen the indigeneity dimension and to systematise impact measurement across partners.

EUNICE is more than a university alliance — it is a living laboratory for testing and scaling the future of higher education. As the global community seeks models that are equitable, agile, and future-ready, EUNICE provides a framework that can be localized, adapted, and expanded worldwide while

preserving institutional autonomy and ensuring evidence-based quality improvement. We invite other alliances and institutions to iterate on this model, contributing data, perspectives, and practices that further advance inclusive, sustainable higher education.

AUTHORS' CONTRIBUTIONS

Conceptualization: MG, TJ; Methodology: MG, MW; Software/Infrastructure: MS, MW; Validation: MG, TJ; Formal analysis: MG, MS; Investigation: MW, MS; Resources: MW, MS; Data curation: MS, MW; Writing – original draft: MG, MW; Writing – review & editing: TJ; Visualization: MW; Supervision: TJ, MG; Project administration: MG, TJ; Funding acquisition: MG, TJ.

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Reconciliation in Action: Deepening Awareness of Bias and Racism Through Collaborative Introspection

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ABSTRACT

In Canada, education is often referred to as the path to success. For youth to develop into responsible citizens, Eurocentric Canadian education systems claim that the attainment of educational credentials is necessary. However, the current educational attainment of First Nations, Métis, and Inuit learners in Canada is far below that of their non-Indigenous counterparts. The dearth of Indigenous ways of knowing and doing in provincially-mandated education systems hinders the success of Indigenous youth, limits opportunities for advancement, and promotes a system of learner inequity by fostering ignorance among educators. Through critical participatory action research, this study focused on determining the perceived challenges non-Indigenous educators experience when bridging Indigenous knowledges in a blended K-12 classroom. The purpose of this research was to determine how collaborative professional development aimed at promoting self-reflexivity and introspection could lead to a deeper awareness of power, privilege, bias and unacknowledged racism when bridging Indigenous ways of knowing and doing in teacher pedagogy. Over a three-month period, participants became more deeply aware of their own racist and stereotypical underpinnings and sought further support to engage with Indigenous knowledge systems in their daily pedagogical considerations. The results of this study showed that collaborative professional development promoted a deeper exploration of both past and present experiences, how those experiences shaped teachers' bias and unacknowledged racism relating to Indigenous ways of knowing and doing, and methods through which participants can continue to engage with reconciliatory education in their blended classrooms.

Keywords

Indigenous Education; Bias; Racism; Action Research; Collaborative Professional Development.

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INTRODUCTION

In recent years, the growing demand for reconciliatory justice and accountability in education has led to the increased adoption of initiatives focused on addressing both historical and contemporary issues of Indigenous peoples in Canada. In response to the Truth and Reconciliation Commission's Calls to Action (2015), provincially-mandated education systems have revised curriculum to include Indigenous histories, worldviews, and knowledge systems in an effort to reduce harm and create inclusive and culturally responsive classroom environments. While curriculum level change represents an important step towards reconciliatory education, it fails to address or confront the Eurocentric, colonized epistemological underpinnings of the educators themselves. Canadian educators, often beneficiaries of dominant colonial narratives steeped in Eurocentric pedagogical teachings, enter the classroom with unacknowledged biases, ingrained worldviews, and often unexamined assumptions about knowledge and learning. These biases do not disappear in the face of revised curriculum, but in many cases shape how reconciliatory education initiatives are interpreted, delivered, and even resisted in educational environments.

Professional development opportunities in Canada prioritize content knowledge, seeking to educate teachers on the when's, where's, why's, and even occasionally the how's of addressing Indigenous content in the curriculum. Critical self-examination and introspection are rarely, if ever, addressed, resulting in classroom efforts for reconciliation becoming superficial and performative. Indigenous knowledge systems and perspectives are often misinterpreted and misrepresented resulting in stereotypical understandings and the tokenization of Indigenous peoples lived experiences. The colonized structure of power and privilege are rarely challenged, and often shape dynamics and interactions in the classroom. Canadian educators are not neutral beings; Rather, they are individuals shaped by their own educational experiences, backgrounds, and belief systems. Teachers' epistemological underpinnings shape how they interpret and interact with the curriculum, assess knowledge, and engage with students whose worldviews differ from their own. Without examining educators' epistemological foundations, reconciliatory education initiatives risk being filtered through the colonized paradigms they seek to unsettle. This research explores how collaborative, introspective professional development can begin to address teachers unacknowledged positionalities, and explore how these positions impact their teaching practice. Rooted in principles of reflexivity, dialogue, and relational accountability, this research argues that professional development opportunities grounded in introspection and deep collaboration can begin to transform the colonized underpinnings that are prevalent in educators in Canada.

LITERATURE

Through an exploration of contemporary literature, education systems in settler colonial nations such as Canada, Australia, and New Zealand continue to be impacted by a legacy of settler colonialism. Misrepresentation and underrepresentation of Indigenous knowledge systems frequently lead to mythical, and often tokenized images of Indigenous peoples, and result in educational inequities for Indigenous learners. Scholars Battiste and Henderson (2009) and Smith (1999) argue that colonial education systems grounded in Eurocentric worldviews must undergo epistemological decolonization and curricular transformation if they are to address these inequities. Provincially-mandated school divisions in Canada continue to address curriculum reform. However, a growing number of scholars assert that reconciliation cannot be achieved through content revision alone. The current limitations

of conventional professional development do little to address the ingrained epistemological understandings that many teachers bring to the classroom.

Teacher Professional Development

As stated by Freeman (2024), the conventional understanding of professional development starts from a premise of deficit and repair. Professional development for educators in Canada operates with the assumption that something in teaching needs to be improved or fixed in order to address concerns in student learning. National policy dictates systemic goals, determining why professional development is required, and what programs are needed to accomplish these goals. The Truth and Reconciliation Commission's Calls to Action (2015) spurred the national and provincial governments into making changes in the education of our learners, and thus professional development bodies designed programs to include necessary training and exposure to Indigenous knowledge systems in Canada. Howell and Ng-A-Fook (2022) claim that many Canadian educators hold a "distressingly limited" amount of knowledge of Indigenous peoples, histories, and contemporary issues (p. 20). This in part is due to a negligible amount of training or education regarding Indigenous issues (Milne & Witherspoon, 2022), as well as the labelling of Indigenous knowledge and perspectives as difficult (Douglas, et al., 2020) or irrelevant in an educators' teaching context (Korteweg & Fiddler, 2018). Many provincially-mandated education systems in Canada have recently amended their teaching quality standards to address the necessity of including Indigenous knowledge and perspectives into teaching pedagogy, but have not considered current educators understanding or 'willingness' to comply with these new regulations.

Current professional development opportunities for teachers in Canada are focused on increasing the knowledge and understanding of Indigenous histories, practices, and perspectives. Land-based learning (McKim, et al., 2024), experiential learning (Battiste, 2002), and community building (Thomas, 2022) are just a few of the methods professional bodies utilize to increase Indigenous content knowledge for teachers. However, what professional bodies have failed to consider is how educators are viewing and interpreting Indigenous knowledge through their own colonized lens. In a study recently conducted by Oloo and Kiramba (2022), teachers show significant resistance to the inclusion of Indigenous knowledge and perspectives in their daily pedagogical considerations. This resistance is often linked to fear, denial, or lack of understanding, and used to distance themselves from acknowledging their own privilege and compliance with the inequity of educational opportunities available to Indigenous learners.

Educators Epistemologies, Bias, and Racism

Despite increasing institutional emphasis on reconciliation, many professional development models continue to treat teachers as neutral implementers of policy rather than as knowledge producers shaped by their own cultural and epistemological frames. Rice et al (2022) argue that many educators practice a purposive and willful ignorance of Indigenous issues as a way to insulate themselves from acknowledging the continued benefits of colonialism, as well as their culpability in maintaining colonized systems of educational oppression. This practice of distancing, which Dion (2016) termed the "perfect stranger" allows educators to remain unchallenged in their knowledge while simultaneously upholding the epistemological and ontological hegemonies that contribute to the objectivity of 'us' versus 'them' (p. 469). In a recent study conducted by (Author, 2025), educators often identify barriers to the inclusion of Indigenous knowledge and perspectives in their daily

pedagogical considerations. Fear of appropriation and reprisal were cited to be a strong hindrance for inclusion in the classroom, and served as methods for educators to distance themselves from acknowledging their responsibility to engage with Indigenous knowledges in the classroom. Vetter and Schieble (2015) underscore how deeply held beliefs—often unacknowledged—shape how teachers perceive students, interpret curriculum, and enact pedagogy. These beliefs are often racialized, classed, and gendered, reflecting broader societal inequalities. In the context of reconciliatory education, teachers may unknowingly reproduce colonial narratives, privilege Western knowledge systems (Author, 2025; Marom, 2018; Poitras Pratt & Danyluk, 2017), or resist Indigenous perspectives that challenge their existing worldview (Bissell & Korteweg, 2016; Braithwaite, et al., 2022).

Education in Canada continues to be both a target and tool of colonialism. Many Canadian educators, whose pedagogical considerations are often underpinned by Eurocentric ideologies, perpetuate colonized norms of teaching and learning (Sokal et al., 2020; Webb & Mashford-Pringle, 2022). Lorenz's (2017) study emphasized that many educators are unaware of how "deeply embedded colonialism is within education" and often refuse to acknowledge how their actions in the classroom reinforce colonized understandings of knowledge (p. 91). Bennett (2021) has witnessed several educators who refuse to acknowledge racist or biased behaviour directed either to students or Indigenous content in the classroom. As Korzinski (2021) states, Indigenous and visible minority students are three times as likely to experience racial abuse, and often these instances of abuse are 'discouraged' by teachers or ignored completely. Kirkness (1999) claims that many educators in Canada feel unable, or are unwilling, to address the deeply held beliefs that form a basis for their understanding of Indigenous peoples or knowledges. While professional development training on Indigenous content is essential, Koehler (2024) asserts that its success depends on educators' willingness to explore their own colonized understandings and perspectives to develop the skills necessary to authentically engage with Indigenous knowledges.

Collaborative Professional Development

While collaborative professional development has gained traction in educational settings for its potential to build community and foster shared learning, many existing models fall short in addressing the deeper introspective work necessary to surface and challenge educators' unacknowledged biases and racial assumptions. These models often prioritize technical skill-building, curriculum implementation, or the exchange of best practices, rather than creating space for critical self-examination (Holmqvist & Lelinge, 2020). As a result, they risk reinforcing surface-level understandings of equity and inclusion without prompting educators to interrogate how their own positionalities and lived experiences shape their perceptions of students, pedagogy, and knowledge systems. Without intentional structures for guided introspection and critical dialogue, collaborative professional development can inadvertently maintain the status quo by avoiding the discomfort and vulnerability required for meaningful reconciliatory transformation. Many collaborative professional development frameworks operate within a decontextualized structure that does not account for the pervasive influence of settler colonialism and systemic racism in education. These models often emphasize consensus and collegiality over disruption and accountability, leaving little room to confront difficult truths about complicity in upholding inequitable systems. For reconciliation-oriented education to move beyond performative gestures, professional development must center introspection as a core component, recognizing that equity work is not simply about what teachers do, but also about who they are, how they see the world, and what they are willing to confront within themselves. Without

this critical inward turn, even the most well-intentioned collaborative efforts may fail to produce the depth of change needed to transform classrooms into truly inclusive and decolonized spaces.

METHODS

Theoretical Framework

This study utilized a critical theoretical framework that recognized participants' knowledge systems as culturally, linguistically, and contextually embedded. Critical theory is often described as interpretative and transformational as it seeks to understand phenomena in its given context (Cohen et al., 2018; Creswell & Poth, 2018). Within this study, it was essential to acknowledge that participants' understandings were shaped and constructed through their individual lived experiences, while also acknowledging how social contexts and cultural narratives formed the basis of their own epistemological underpinnings. With this lens, participants were seen as active knowledge holders who brought implicit understandings and interpretive frameworks shaped by their everyday realities, historical experiences, and linguistic practices. This study focused not on eradicating these knowledge systems, but on deeply exploring the underlying biased and racist viewpoints that shaped how the participants viewed Indigenous knowledge systems in their pedagogical considerations. This critical theoretical framework shapes both the design and interpretation of the research, ensuring that participants' voices are not only heard but understood on their own terms.

Research Method

This study employed a critical participatory action research design to explore the epistemological underpinning of educators in K-12 blended classrooms. Critical Participatory Action Research (CPAR) is rooted in critical theory and informed by principles of advocacy, social justice, and relational accountability (Lenette, 2022). As a decolonial research methodology, CPAR utilizes reflexive and culturally grounded approaches to understand phenomena in its lived context. Utilizing a Critical Participatory Action Research framework, we explored how collaborative, introspective professional development can surface and address teachers' epistemological biases and assumptions in the context of bridging Indigenous knowledge systems into daily pedagogical considerations. The participants and I actively engaged in the cyclical nature of CPAR, creating spaces where we could critically examine how our epistemological foundations interacted with reconciliatory initiatives, and manifested in our classroom dynamics. This study explored perceived challenges that educators identify that limit their ability or willingness to engage with Indigenous knowledge systems, how their own epistemologies contribute to distancing methods, and how collaborative introspection can begin to unsettle unacknowledged instances of bias and racism in educators' pedagogical considerations.

Research Design and Participants

Epistemological bias and racism are sensitive topics for educators to explore in the context of bridging Indigenous knowledge systems in their classrooms. I aimed to recruit Canadian educators who were open to exploring their pedagogical and epistemological underpinnings with an open mind, and a willingness to engage in deep self-introspection. As Canada is a large country, I focused my recruitment to the province of Alberta, and successfully recruited four non-Indigenous participants from different locations, diverse teaching grades and subject areas. Participation was guided by ethical protocols of informed consent, confidentiality, and the right to withdraw. Respect, relevance, reciprocity, and responsibility were embedded throughout the research study to ensure relational accountability

between all participants. Guided by an Indigenous education colleague, the participants and I engaged in a multi stage study focused on exploring our own unacknowledged beliefs and understandings. The first stage explored our perceived barriers to bridging Indigenous knowledge systems in our blended classrooms. Once these barriers were collaboratively identified, stage two commenced with a guided exploration of pedagogical considerations that could fill in knowledge gaps, and address perceived barriers for implementation in our classrooms. In stage three, the participants and I spent three months actively engaging with and bridging Indigenous knowledge systems in our daily pedagogical considerations. The final stage offered the opportunity for deep self-reflection and introspection through collaborative discussions and reflective journaling.

Data Collection and Analysis

To gain a fulsome picture of the experiences of participant educators, and to provide opportunities for thoughts and opinions to emerge, this study employed semi-structured interviews, collaborative focus group sessions, and introspective journals as tools for data collection. Open-ended interviews were used at the beginning and end of the study to identify perceived barriers, explore participants' understanding of Indigenous knowledges, and identify experiences of engagement with Indigenous content in teacher pedagogy. These interviews were instrumental in articulating participants' positionalities, personal and professional histories, and perceptions of reconciliatory education. Focus group sessions were held at different stages of the research study, and provided an opportunity for participants to collaboratively engage in self-introspection, and explore opportunities for professional development with the guidance of our Indigenous education colleague. Through the entirety of the study, participants maintained introspective journals, documenting their increased self-awareness, learning, instances of struggle or resistance, as well as an exploration of one's own ontological belief system. Data analysis followed a critical manual thematic analysis approach outlined by Naeem et al. (2023). Aligning with the democratic principles of CPAR, participants were invited to verify transcripts and offer interpretations or clarifications to the raw data. Iterative cycles of immersion in the data (Green, et al., 2007), coding, interpretation, and member checking were performed over a four-week period. Initial codes were generated from individual interviews transcripts, focus group sessions, and introspective journals.

FINDINGS

As this data is part of a larger study (Author,2025), this article will focus on examining how collaborative professional development can lead to the surfacing and addressing of unacknowledged positionalities, the manifestation of those positionalities in blended classroom practice, and how collaborative introspective professional development fostered professional growth and relational connection among educators.

Surfacing and Addressing Unacknowledged Positionalities

Collaborative introspective professional development sessions provided an opportunity for teacher participants to critically reflect on their social, cultural, and epistemic positions. Through collaborative discussions, participants determined that past exposure to biased and racist remarks of Indigenous populations was a key factor in shaping their epistemological understandings of Indigenous peoples and their lived experiences. Participant one recalled an incident where a primary school teacher used the phrase "stop running around like wild Indians". At the time, the participant interpreted this as a directive to calm down and behave quietly. However, as an adult, they now realize that the phrase

reinforced a negative bias that shaped how they viewed Indigenous people during their childhood. Participant two shared an experience from a family conversation:

I remember my dad complaining about Indigenous peoples and their fight for equal rights. I can't recall what right they were fighting for but I remember my father saying 'Oh well, if they want to go back to the way things were, give us all our technology back and they can go have their tipis again'. Unfortunately, at the time, that was the norm.

Within these collaborative introspective discussion sessions, participants often remarked that when someone shared a memory, it would often spark memories that had previously been forgotten. Participant three noted that after hearing the story of the teacher yelling at the students, it sparked a memory from primary school. This participant noted:

One morning we were sitting in our desks taking attendance and the teacher called the name of a student who was absent. This student was Indigenous and one of my classmates asked the teacher why the student was always absent. Her response to this student was 'Obviously, they're just not interested in learning'. 'None of them are interested'. I didn't think much of it at the time, but looking back now I can see that this formed a stereotype that all Indigenous students weren't interested in school.

Participant four supported this observation by referencing the portrayal of Indigenous characters in children's entertainment:

When I was little, different movies that I watched like Peter Pan or Mickey Mouse, because Disney was thought to be a safe thing to watch as a kid and so that's what we got to watch at home, just some of the imaging and how they depicted Indigenous individuals. That was terrible. How we degrade certain cultures and how they were viewed in society was incredibly awful.

Participants acknowledged that childhood exposure to biased language, social imagery, and cultural representations played a significant role in shaping their early perceptions of Indigenous peoples. With increased self-awareness and critical reflection, participants began to recognize that while their personal perspectives may have changed, stereotypical and racist representations of Indigenous individuals are still prevalent in social and educational settings. The participants in this study indicated that their current exposure to bias and racism toward Indigenous populations primarily stems from experiences within school and community contexts. Resistance from parents and students, as well as a lack of support or acknowledgment from educational colleagues and administrators, heightened participants' awareness of unacknowledged racist and biased beliefs in their schools. Participant three shared a recent experience with a school administrator:

There was a day at the end of June where a group of Indigenous Knowledge Keepers came in and they brought all these teepee poles and we had this huge outdoor round dance with 600 people holding hands and going in and out and it was great. And then they kind of left their materials in our school gym and the next day we were supposed to have the grade six graduation or convocation, or whatever you want to call it, and the principal came in and said 'Oh, geez, there you go. What do you expect? There are all the tipi poles. Not a big surprise, I don't know what I was expecting. I knew they were going to disrupt and ruin our grade six celebration because they were too lazy to take them home'. So, to me that was kind of ironic because it was like one of our first big pushes to integrate Indigenous ways of knowing and

doing, but it's interfering with our quite Eurocentric celebration. You know the feeling that came through loud and clear was that it was a great experience that we had yesterday, but now it's interfering with what's really important.

Participant two also related recent experiences from their school classroom claiming that many parents would excuse their students from learning about Indigenous knowledge systems or practices. These parents refused to acknowledge that these teachings were part of the curriculum and degraded this knowledge openly in front of their children.

They're still at that age where they put a lot of stock in what other people say. So, the kids that were pulled out of the activities are definitely the ones that have a lot more negative view. I would say that it's still quite insular for going along with what their families believe or what they've heard from other people, and they're too young to recognize the systemic racism that's within that, or to even realize that that's what is happening here.

Manifestation of Positionalities in Classroom Practice

Through critical introspection, participant teachers in the study began to recognize how their internalized racist and stereotypical beliefs about Indigenous peoples, shaped by early socialization, media portrayals, and dominant colonial narratives, had influenced their professional practice. These introspective examinations prompted educators to acknowledge the subtle yet powerful ways in which their pedagogical choices could perpetuate Eurocentric norms. Participant three strongly expressed how Eurocentric beliefs dominated the Music program of studies in Alberta:

We have a very Eurocentric understanding of what a lot of the fine arts, and especially music, should be. It's very much a Eurocentric curriculum, and it's sort of reinforcing all those Western musical ideals. We teach about Beethoven, Mozart, Bach, and others. We have to teach about 'world music' but that focuses more on Asian or African rhythms. Where is Indigenous music?

Participant four built off this discussion stating while they were teaching the science curriculum, it became apparent that most of the knowledge and understanding they were meant to convey to students reinforced a strong Eurocentric understanding:

So, with my human sciences curriculum, most of our imaging is very, like very Eurocentric and some of the procedures also the same very Eurocentric. So, we're talking about shock. Are they cool and clammy? Are they pale? So, what does that look like in all cultures? The curriculum doesn't include many of our population, especially in the school that I've worked with. How can you tell if someone is in shock if they're not necessarily the type that are going to look paler than, you know, they do on an average day?

In one collaborative session, Participant one acknowledged that their teaching methods also reinforced a very Eurocentric understanding of teaching and learning:

I think one area where I have found myself confronting my own unconscious bias at the time, but conscious now, was when I was taking the opportunity to do some land-based education. I took my students outside because we were trying to identify different nature sounds. As soon as we got outside my students, they all kind of scattered, and they were all doing their own thing, and for me, I felt very disorganized, and you know, I automatically wanted to bring everybody back in so that they were in my sphere of control. I realized that I had been trained in a way that made me think that I needed to have control over my students, and that I needed

to direct them in their learning, and that really caused me to confront the way I manage my teaching.

As participant educators deepened their awareness, many identified specific teaching practices that implicitly reinforced colonial ideologies such as celebrating national holidays, relying on textbook narratives that centered a colonial viewpoint, or omitting Indigenous voices from literature and historical content. Through deep collaborative introspection this process challenged their unacknowledged viewpoints and emphasized the need for ongoing professional learning to create more inclusive and socially just educational environments.

Professional Growth and Relational Connection Through Collaboration

Another key finding was the emergence of new understandings of what it means to be a teacher in the context of reconciliation. Participants began to reevaluate their professional identities; Not as experts or authorities, but as co-knowledge holders and learning facilitators. Participants demonstrated significant pedagogical growth through the incorporation of Indigenous teaching methods into their classroom practices. This evolution included a deeper engagement with Indigenous ways of knowing and doing, as well as a heightened recognition of the educational value of bridging Indigenous knowledge systems into daily instruction. Participants noted improved student attentiveness and engagement when employing these approaches. Participant three noted:

When you've been doing sort of the same subject and grade level for almost a decade, like it's really easy to just the 'Oh I know what I'm doing' and not really question it not really try to switch it up. When I'm being intentional and trying to incorporate more Indigenous ways of knowing into what I'm teaching, I found that was really effective and really productive and ultimately really meaningful for the students. I'm more conscious and aware of it now.

Also supporting this stance, Participant two stated “*I'm pleasantly surprised with how it impacted my students' understanding. This gave another way for students to understand and build connections in our world*”. Rather than attempting sweeping changes, participants reported that small, intentional steps led to meaningful transformation in their pedagogical outlook. Participant four highlighted the importance of gradual implementation, stating that the act of forming consistent habits around Indigenous practices made it easier to sustain them over time.

It's almost like a habit we've created. Now we're in the practice of it, and so because of that practice, it's easier now. I've come to the realization where I don't need to go big or go home. I've taken the time to put in small pieces and we're going to build on that. I'm going to take it one step further. Even though I'm not confident in all things, I know that small pieces are going to build into bigger pieces.

This approach created space for confidence and capacity to grow incrementally. These shifts highlight the importance of reflective practice in challenging established routines and re-centering pedagogy around diverse knowledge systems. As participants continued to engage in this study, their acknowledgement of the relational connection and supportive structure of collaborative introspection contributed to their sense of professional growth and well-being. Participant four reflected that without the support of fellow participants

I don't know if I would have been able to continue without us all going through what we've already been through. So, this process has provided an opportunity for that collaboration to happen. I didn't know I needed this to make it happen.

Participant two also noted that without the support of their fellow study members they likely would have abandoned efforts for implementation at an early stage.

PD for me.... it's disjointed. They say, 'here are the things you can do', and you try it once and it doesn't work, and then I don't do it. Whereas with this it's because it's developed in this collaborative way. It's still mine but if it doesn't work I have the opportunity to go back and say 'I tried it, it sucked. What do I do now?' and then we work on it together. I think about that a lot. I don't think I would have done as much if I didn't have other people to talk to.

DISCUSSION

The findings of this study highlight the transformative potential of collaborative, introspective professional development. By surfacing unacknowledged positionalities, fostering critical examination of pedagogical practices, and supporting meaningful professional and personal growth, collaborative introspective professional development can begin to address true reconciliatory education. The data highlights that educators, when engaged in collaborative, introspective dialogue with their peers, can confront the implicit biases and racist stereotypes they have internalized about Indigenous people and their lived experiences. As explored within the research, these biases, shaped through personal experiences, media, and institutional narratives, had remained largely unexamined prior to their participation in this study. The process of collective introspection served not only to recall moments of internalized racism, but also to contextualize them within the broader framework of colonial discourse and its persistence in contemporary education. As educators revisited formative experiences from classroom incidents, family beliefs, and media representations, they began to recognize and acknowledge how these experiences informed their own epistemological positions and influenced their perceptions of Indigenous knowledge and peoples. Participants noted that hearing others' stories at times triggered their own memories, indicating that these recollections had remained unchallenged until brought to light through collaborative discourse. This supports existing literature on critical reflexivity, which positions dialogue as central to developing self-awareness and dismantling dominant ideologies (Battiste & Henderson, 2009; Goulet & Goulet, 2015). This study extends those insights by demonstrating that surfacing individual positionalities is not an isolated or individual task; it is a relational, ongoing process made possible through intentional, sustained introspective collaboration among educators.

Collaborative introspective professional development created a safe environment where educators were able to critically reflect on their social, cultural, and epistemic positions. This exploration was both uncomfortable and illuminating, serving as a starting point for deconstructing inherited norms and values. These moments were made possible by a shared commitment to relational accountability and an ethic of respect and care that framed the collaborative space. As participants began to determine how their positionalities had been and continued to be influenced, a deeper awareness of biased and racist viewpoints and how they manifested in their classroom environments became apparent. Participants collaboratively identified when pedagogical choices for content delivery, classroom management, and curricular resources aligned deeply with Eurocentric models of teaching. This recognition of embedded Eurocentric practices led participants to make more intentional shifts in

their pedagogical considerations. The collaborative structure of this study emerged as a key factor in sustaining this transformation. Participants consistently reported that the ability to share, revisit, and refine their approaches within a supportive network gave them the confidence and motivation to persist, even when implementation was challenging. Unlike traditional professional development models that are often top-down and disconnected from daily classroom practice, the relational and iterative nature of this study's approach allowed for ongoing dialogue, adaptation, and emotional and mental support.

This study contributes to the field of teacher education and reconciliation by demonstrating that collaborative, introspective professional development can serve as a powerful mechanism for surfacing and disrupting biased and racialized positionalities, reconfiguring pedagogical approaches, and fostering authentic professional growth. The sustained engagement with fellow participants fostered a sense of community and accountability that supported risk-taking and reflection. Educators noted that being part of a learning community committed to reconciliation and decolonization provided both motivation and moral support to persist through discomfort and resistance. The nature of collaborative introspective professional development allowed for diverse entry points and respected the lived experiences of participant educators. As education systems across Canada focus on meeting the Calls to Action (TRC, 2015), initiatives such as this provide a compelling model for how educators can move beyond performative reconciliation and toward substantive transformation rooted in relational accountability and critical introspection. These findings suggest that collaborative, introspective professional development can create the conditions for meaningful transformation in educators' beliefs, identities, and practices. When teachers are supported to confront their own unacknowledged biases and engage with alternative epistemologies, reconciliatory education moves beyond curriculum into the realm of relational, justice-oriented pedagogy. The findings of this study reveal a critical gap in reconciliatory education initiatives: while school divisions increasingly revise curricula to include Indigenous content and perspectives, many fail to support educators in undertaking the epistemological and identity-based work necessary to teach that content responsibly. As this research has shown, professional development that is collaborative, sustained, and introspective can serve as a powerful intervention, disrupting ingrained assumptions, surfacing hidden biases, and prompting educators to reimagine their roles in decolonizing the classroom.

CONCLUSION

This study explored the potential of critical participatory action research (CPAR) as a methodology to engage educators in deep, introspective professional development within the context of reconciliatory education. The findings highlight that meaningful reconciliation in schools is rarely achievable through curriculum revision alone. Instead, truth and reconciliation demand a fundamental reorientation of teachers' epistemologies, identities, and pedagogical practices; An endeavour that requires time, commitment, and critically introspective learning spaces. Reconciliation in education cannot occur without educators who are willing to confront their own roles in upholding colonial systems and who are supported to grow through that confrontation. When professional development is structured as a relational, critical, and participatory process, it can foster the epistemological unlearning and pedagogical transformation necessary for reconciliatory education to move beyond symbolic gestures into meaningful practice. Educators must be supported in acquiring knowledge about Indigenous histories and perspectives, and also in deconstructing the colonial and racialized assumptions that often mediate how such knowledge is received and enacted. Without this critical work, reconciliatory

education risks becoming another site of performative inclusion that ultimately reinforces settler colonial dominance. Collaborative introspective professional development provides the time, space, and support to do this difficult but essential work in community with others, reducing isolation and fostering a shared commitment to systemic change. By positioning teachers as co-learners and co-constructors of knowledge, this model aligns with Indigenous principles of learning and offers a sustainable pathway toward equity and decolonization in education. As such, it is not just a promising alternative, it is the future of professional development in an era of reconciliation.

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Open Educational Resources and Digital Curation: Possible Paths to Sustainable Education

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ABSTRACT

In the Universal Declaration of Human Rights, education is understood as a universal right with free and equal access at elementary levels with an emphasis on human formation. The democratization of access to knowledge is constituted as a mechanism for the dissemination of information for accessible and quality education. The research deals with the study of the open movement in the context of Open Educational Resources, which are under open licenses for use and reuse. These resources are available in digital repositories that enhance the practice of the Open Science movement, which is based on the values of collaboration and sharing scientific knowledge in a transparent way, providing spaces for Open Education. This paper aims to discuss the concepts and potential of OER and Digital Curation in education. The aim of this study is to investigate how OER and Digital Curation can contribute to inclusive and sustainable education. In this sense, a qualitative research approach was carried out which was divided into phases: a literature review on the subject and mapping of digital platforms to analyze open resources with an emphasis on the teaching and learning process. The contribution of OER together with digital curation is their potential to build spaces with sustainable and collaborative practices, while at the same time promoting access, reuse and sharing. This paper presents a proposal for digital curation of OER, which are essential tools for supporting lifelong learning, encouraging the sharing of knowledge and for innovative education.

Keywords

open educational resources, digital curation, open science, open education, systematic review, digital platforms, teaching and learning, innovative education, open practices, sustainability

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INTRODUCTION

The Universal Declaration of Human Rights (UDHR), adopted in 1948 by the United Nations General Assembly (UN, 1948), presents the concept of universal rights. According to Schutz and Fuchs (2017), the topic of human rights has become a subject of concern and debate in various international conferences. Furthermore, it has increasingly become the focus of public policy initiatives in many countries, as these rights are intrinsically linked to human coexistence and are closely related to issues such as education, equality, diversity, and social inclusion.

Currently, education faces significant challenges in a rapidly evolving technological landscape. As a result, educational systems are undergoing profound transformations, particularly in the production of teaching materials suited to digital contexts. From this perspective, Masetto (2014) notes that the expansion of environments for knowledge production and sharing has driven educators to adopt teaching strategies that were not part of their initial training. Consequently, the new technological scenario demands from teachers new approaches to planning, producing, and curating educational materials that foster meaningful learning experiences. In contemporary society, education plays a vital role in the development of teachers, students, and researchers, who are increasingly engaged in open, inclusive, and collaborative practices supported by accessible methodologies and technologies. In alignment with UNESCO, the report “Reimagining Our Futures Together: A New Social Contract for Education” (UNESCO, 2022) advocates for an equitable and high-quality education that promotes social inclusion and sustainable development. In this context, education for sustainable development must be closely tied to social progress and the response to environmental and economic challenges, aiming to restructure educational practices in ways that foster innovation.

The Innovative movements in the field of education have fostered spaces for various reflections, with digital technologies emerging as a driving force that plays a central role in the learning process due to their direct impact on how learning occurs. Within the context of the Open Education movement, open resources and environments are practices that encourage collaborative production and expand educational opportunities for teaching. Similarly, shared knowledge is constructed by multiple individuals with common interests (Furtado & Amiel, 2019). In this sense, the practice of Open Education is grounded in a culture of knowledge sharing. In light of the new educational landscape shaped by the COVID-19 pandemic, new teaching and learning strategies emerged, transforming the educational scenario across various sectors of society, particularly in how education is delivered. In response to this situation, Emergency Remote Teaching arose as an alternative to ensure the continuity of education, thereby making the digital era an essential and irreversible component of the educational, social, and cultural spheres (Nóvoa, 2022).

Faced with the obstacles caused by the pandemic, Open Educational Resources (OER) and Digital Curation (DC) are strong allies in this new scenario. OER were established by the United Nations Educational, Scientific and Cultural Organization (UNESCO) in 2002 at the first global forum on Open Educational Resources. Open educational resources (OER) are characterized as materials with great

potential for teaching, such resources allow open access with free use, adaptation and sharing (UNESCO, 2015). In this sense, OER have become an alternative form of teaching material to enhance the process of collaboration between teachers. The OER movement is seen as a comprehensive part of the Open Education (OE) movement. It is worth mentioning that the concept of OE according to (Amiel, Gonsales and Sebriam, 2020) is defined in a simplistic way that is characterized as forms of sustainable alternatives that promote spaces for accessible and quality education. It is worth noting that the education system points to the need for accessible and equal education for all, which is evidenced in the 4th goal “Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all” (SDG 4) (UN, 2015).

With the popularization of the Internet, Open Education together with OERs has boosted collaborative production and the sharing of scientific knowledge, opening up new horizons for the construction of an equitable education. From this perspective, the article aims to investigate how OER and Digital Curation can contribute to inclusive and sustainable education, as well as analyzing how digital platforms for open resources can be integrated into education to promote the training process of open and sustainable practices for the democratization of scientific knowledge. In view of this, the study is guided by the following questions:

1. What thematic areas stand out in the study, and how are they connected to Sustainable Development?
2. What gaps were identified in the study through the reviews?
3. How can Open Educational Resources and Digital Curation contribute to inclusive education and sustainable practices in the face of the challenges of the contemporary world?
4. What elements should a digital platform have to support the sharing of open resources through digital curation activities?

To address the research questions, this article conducted a literature review and an analysis of the concepts of Open Educational Resources (OER) and Digital Curation, with a focus on their application in the educational field particularly in basic education and their role in promoting open educational practices. A more in-depth investigation was carried out to identify digital platforms that host open resources under open licenses, supporting digital curation activities. These platforms were examined with particular attention to open practices and collaborative sharing. This article offers an additional contribution to the literature on digital curation in the context of OER, presenting an applied study focused on the process of investigating and selecting content from repositories and digital platforms for use and reuse, with an emphasis on sustainable educational practices.

The study is structured as follows: following an overview of the literature on Open Educational Resources (OER) from the perspective of Open Education and Digital Curation, along with their challenges and contributions in the context of sustainable practices, the methodological approach is presented and discussed throughout the analysis. The article concludes with recommendations and implications based on the findings, along with suggestions for future research.

LITERATURE REVIEW

Open Science and Its Relationship with Open Education

The use of digital technologies has radically transformed the way knowledge is produced, accessed, and disseminated. In this context, the movements of Open Science and Open Education, although expressed through different terms, share a common goal: to democratize access to knowledge by making it transparent, inclusive, and collaborative. Open Science is a broad movement that seeks to make research accessible to all levels of society, not just to a specific academic community. According to Silva and Silveira (2019), the origins of the concept of Open Science (OS) lie in the promotion of scientific transparency, encompassing all stages of research from planning to the use of open-source software and databases in order to enable free distribution and reproducibility of studies.

In parallel with the principles of Open Science, Open Education emerges as a movement aimed at democratizing access to teaching and learning. According to Sebriam, Gonsales, and Amiel (2021), Open Education is considered fundamental for life in society, as it emphasizes sharing practices, the power of solidarity, and the challenges that arise when collective actions are undertaken to ensure individuals' rights in a communal context. Educational knowledge should be freely accessible, reusable, and adaptable. This is made possible through Open Educational Resources (OER) teaching and learning materials made available under open licenses that allow for use, adaptation, and redistribution.

Open Education aims to promote practices, open environments, and resources that foster plurality, authorship, and the protagonism of both teachers and students, emphasizing the production of shared knowledge built by various people around common interests (Furtado & Amiel, 2019).

This emerging educational movement combines the tradition of sharing good ideas with fellow educators and the culture of the internet, marked by collaboration and interactivity. This educational approach is built on the belief that everyone should have the freedom to use, customize, improve, and redistribute educational resources without restrictions. Educators, students, and others who share this belief are joining together in a global effort to make education more accessible and more effective. (Open Education Declaration – 10-Year Anniversary, 2017, p. 3)

The relationship between Open Science and Open Education is particularly evident in the educational context. When research is conducted under open principles, it generates a wealth of data and evidence that can be directly incorporated into teaching practices. This enables learning based on real facts, stimulating critical thinking and student autonomy. Teachers, for example, can use open data in practical activities, while students explore the results of scientific research as part of the learning process.

In addition, Open Education plays a fundamental role in the Open Science culture by training critical and aware individuals who are able to interact with adaptable and reusable educational materials. Thus, the integration of these two movements points towards a more collaborative educational society, connected to current challenges.

Open Educational Resources and Digital Curation: Contributions to Innovative and Sustainable Education

Open Educational Resources (OER) are defined as resources with the potential to promote collaborative teaching within educational environments. One of the core concepts of OER is the usability, adaptation, and reuse of existing materials, thus enabling the sharing of knowledge. Additionally, their open access fosters the creation of personalized learning in a cost-effective manner (Piedra et al., 2016). From this perspective, it is important to highlight that OER present variations in openness, they can be either open or closed. These characteristics are essential for understanding their use and applicability according to the type and nature of each resource. UNESCO (2015) defines OER as materials that can be accessed, used, reused and shared freely, in the public domain or with open licenses, thus allowing them to be used and adapted by other users. OER are materials that can be textbooks, videos, courses, software, games and any other resource that encourages access to knowledge and its sharing.

The purpose of open educational resources is to enhance the teaching and learning process for various students and promote social inclusion for those who are in vulnerable situations, given that these educational resources are available free of charge. In this way, it promotes education with equal access for a greater number of students. According to UNESCO(2015), a number of measures need to be taken to make education more accessible and equal. Governments are suggested to: create education policies to support the development of OER, adopt license frameworks and open standards for the use of OER, contribute to promoting awareness of the main issues related to OER, support strategies that promote sustainable development and the sharing of resources that foster quality learning.

However, the usability of open educational resources in teaching and learning spaces presents many challenges, especially in the design and construction, especially when institutions have limited resources. Therefore, it is essential to have the support of the planned and systematic development of OER, with a view to improving teaching materials for learning as pointed out (UNESCO, 2015).

It should be noted that OER are any educational resource that has an open copyright license that allows the application of the 5 Rs, represented in Figure 2.

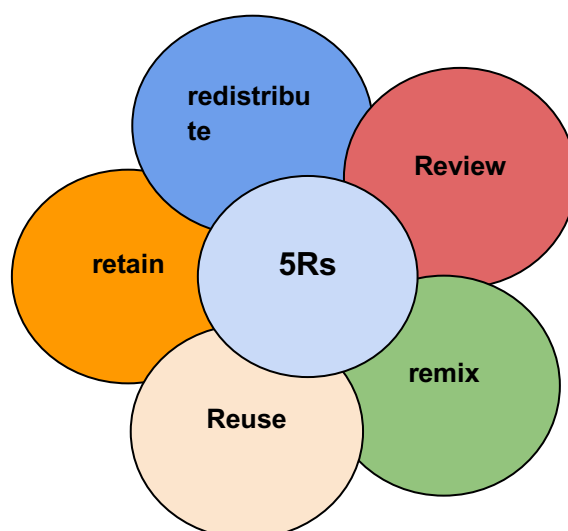


Figure 1. Representation of the 5 R's of OER, adapted from Wiley (2014)

Open educational resources have essential characteristics that categorize them as public domain teaching materials that can provide users with free permission that encompass the activities of the 5Rs:

- Retain- gives the user the right to do, i.e. they have the control to download, store the materials;
- Reuse - The user has the right to use the resource in various ways, such as study groups;
- Revise- the right to adapt, modify content to meet your needs and those of others in a specific way;
- Remix - allows the user to combine original material with other content to produce a new resource;
- Redistribution - the user has the right to share the content produced, whether original or remixed/recombined.

From this perspective, Open Educational Resources (OER) can foster the production and sharing of knowledge as well as the democratization of education. Another important development was the emergence of Creative Commons (CC) licenses in 2001, which granted greater credibility to OER and facilitated broader access for the community at large, as well as the legal framework for making content openly available, as described by Wiley (2006). Thus, licensing is an essential characteristic of OER. According to Creative Commons (2017), these licenses enable the sharing of OER and provide creators with a simple and standardized way to allow others to use, adapt, and redistribute their works.

In this context, OER serve as tools that create accessible environments to promote a culture of knowledge sharing in an equitable and sustainable manner, opening new pathways to democratize access to quality education and driving a more dynamic and responsive learning ecosystem that meets the demands of our time.

In the context of Digital Curation (DC), the term has been the subject of increasing discussion in recent years, originating around 2003 in the fields of Information Science and Computer Science, due to the rise of digital information. According to the Digital Curation Centre (DCC) (2019), digital curation is a detailed, ongoing, and interdisciplinary process that involves the maintenance, preservation, evaluation, re-evaluation, use, and reuse of digital data, adding value across the various stages of the digital content life cycle. The life cycle model of digital curation has been endorsed by the DCC and is applicable across multiple fields, including the evaluation of Digital Teaching Materials (DTM) derived from Information and Communication Digital Technologies (ICDTs). These technologies encompass software and digital educational resources, which may also include Open Educational Resources (OER) (Silva, 2013). This model systematizes the curation actions that can be applied in a variety of contexts. The figure below illustrates this systematization.

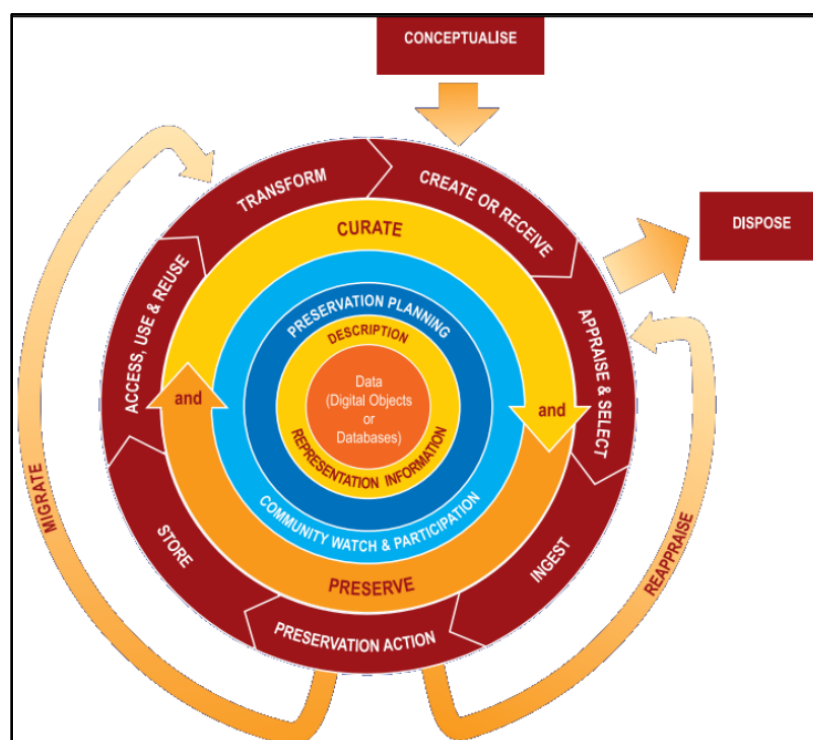


Figure 2. Digital curation life cycle model (Digital Curation Centre, 2014.)

From this perspective, digital curation is understood as an active process grounded in systematized actions, characterized by the intentional selection of content, with a focus on preservation to ensure future access with quality. In this way, the digital curation process is of great importance, as the methods of filtering and selecting content ensure that materials follow specific stages aligned with the actions outlined in the DCC model, which include: conceptualize, create, access and use, evaluate and select, dispose, ingest, preserve, re-evaluate, store, access, reuse, and transform. In the educational context, digital curation gained greater visibility during the COVID-19 pandemic, particularly with the growing demand for teaching materials created by educators to meet the needs of Emergency Remote Teaching (ERT). In this sense, when the discussion of curation extends to the field of education, several related terms can be observed, such as: online content curation, digital teaching material curation, and open educational resources curation, as noted by Guterres et al. (2020), Rodrigues (2022), and Litto & Mattar (2017). Thus, this study understands that teachers play an important role as educational curators of Open Educational Resources (OER). The educational curation process involves screening, evaluating, and organizing materials. In practice, the curator, typically the teacher, is responsible for ensuring the quality and reliability of content, thereby supporting greater flexibility and personalization in teaching and learning. Supporting this view, Chechinell (2017) states that digital teaching materials can be understood as any digital resources used in educational settings within a broad context, encompassing a range of related terms such as digital learning objects, reusable educational objects, among others.

In education, it is important to emphasize that digital curation creates pathways for the selection of materials by a curator, making such resources accessible to teachers seeking materials on specific topics or themes relevant to their work. Thus, it becomes clear that digital curation enhances studies and practices by creating opportunities to transform ideas developed through digital tools. It encompasses and integrates everyday practices such as accessing and reusing digital resources, while also promoting actions that advance the open education movement.

METHOD

Research Design

This research is grounded in a qualitative and descriptive approach, as proposed by Gil (2019), which seeks to understand the object of study within its field of application. We present the procedures used to conduct the study and the steps followed throughout its execution. To address the research objective, a Systematic Literature Review (SLR) was conducted. This method not only contributes to reducing duplicated studies but also allows for the reuse of research findings and their application in various contexts (Galvão & Ricarte, 2020). The review followed the steps outlined in Table 1, with the intent of proceeding with the analysis to integrate data collected from different studies on Open Educational Resources (OER) and Digital Curation. The purpose of this study is to investigate the scientific production on this topic over the past ten years, highlighting the definitions and characteristics that help understand the structure and emerging trends related to the subject.

Between 2014 and 2024, the rapid development of technologies for learning has led to significant changes in the way OER are perceived and used. These advancements have introduced new challenges in the technological field, requiring new approaches for the integration of OER in teaching and learning processes. In light of this scenario, several policies and strategies have been adopted to meet the goals of the 2030 Agenda proposed by UNESCO (Jemni & Khribi, 2017). The 2030 Agenda aims to promote sustainable development and is aligned not only with free and open access to content-based educational resources, but also with the advancement of Open Education concepts. Researchers have increasingly focused on practice-oriented approaches that encourage collaboration between students and teachers to produce and share knowledge using OER, known as Open Educational Practices (OEP) (Cronin, 2017).

In addition, the study aimed to map digital platforms that host open educational resources, with an emphasis on curation for the teaching and learning process. In this regard, the research sought to identify and locate OER, considering their benefits for both students and teachers. These resources support the teaching and learning process while also reducing costs related to instructional materials by offering open access to educational content. According to Ozdemir & Bonk (2017), locating high-quality OER can be challenging among the thousands of resources that are published.

Open Educational Resources (OER) are found in repositories or digital platforms that function as digital databases, storing various learning resources such as applications, tools, videos, and images (McGreal, 2011). In these repositories, users can search for and identify OER, as well as classify and download them along with their metadata (Atenas & Havemann, 2013, 2014). In this regard, several platforms stand out. For example, Merlot (<https://www.merlot.org/merlot/index.htm>) is a platform that enables the sharing, evaluation of learning objects, and other collaborative activities carried out by users. The online platform ReliA (<https://relia.org.br/>) is an initiative of Educação Aberta in collaboration with Instituto Educadigital and the UNESCO Chair in Open Education in Brazil. On this platform, users can register resources by specifying the license type, content, and theme, which helps in locating appropriate resources. Resources are organized into categories such as: type of material and theme; category; location (of the resource); subject; availability (online or offline); language; field of knowledge; educational level; usage; and license type. Users can directly access resources with options to download and share the materials. It is also important to highlight the OER World Map (<https://oerworldmap.org/>), where users can search for resources by specifying content, institutions,

researchers, OER repositories, and even by location. Table 1 presents a selection of repositories and digital platforms of Learning Objects, with brief descriptions and based on selection criteria such as free and open access and alignment with basic education.

Chart 1. Repositories and digital platforms for learning objects

Repositories	Description
OER Commons	A digital library of open educational resources where users can explore, create, and collaborate with educators to promote participatory and open education.
Multimedia collections	Offers a variety of resources. Users can share, copy, and distribute works under specific credit attribution rules, with content made available under Creative Commons licenses.
OpenLearn (The Open University - UK)	An open platform from the Open University in the UK. It provides free materials developed by one of the leading distance education institutions, offering online courses and high-quality content.
Public Domain Portal	Provides access to scientific, literary, and artistic works in text, image, and video formats that are in the public domain.
REALPT: Open Educational Resources for Reading and Text Production in Teacher Education Programs	Offers resources focused on multiliteracies for students, especially those in teacher education programs. A wide variety of OERs are available in Portuguese, Spanish, and English, under the Creative Commons CC-BY license.
BIOE: International Bank of Educational Objects	Provides resources with open licenses, covering various educational stages. It also includes open-access materials for vocational and technical education.
MEC RED	A repository that includes videos, animations, and other materials targeted for use in education.

Based on the mapping carried out of some repositories and platforms of learning objects, it is evident that, in addition to providing resources for basic education, they also offer materials for other educational areas, such as REALPT and BIOE, which include teacher education programs and vocational education. These repositories promote spaces for digital curation aimed at sustainable practices that foster knowledge sharing from the perspective of the open movement through Open Educational Resources (OER).

From this perspective, Table 1 presents the stages of the research that were carried out for the data collection in the literature review. Systematic reviews may present converging or diverging results that can contribute to future studies on the terminologies related to the topic under analysis (Sampaio & Mancini, 2007).

Table 1. Description of the stages of the systematic review process

Steps	Methods highlighted by Sampaio and Mancini (2007)	Procedures carried out in the systematic review
1	Definition of the question	What thematic areas stand out in the study, and how are they connected to Sustainable Development? What gaps were identified in the study through the reviews? How can Open Educational Resources and Digital Curation contribute to inclusive education and sustainable practices in the face of the challenges of the contemporary world?
2	Identification of databases	Eric e BDTD
3	Definition of keywords	“open educational resources” AND “ open education” AND “digital curation”
4	Search strategies	Keyword combinations used: “open educational resources” AND “ open education” AND “digital curation
5	Exclusion and inclusion criteria	Exclusion criteria: period, duplication, titles, abstracts. Inclusion criteria: fundamental elements of a scientific article.
6	Conducting searches	Search in the databases established from the selection of key words
7	Application of the selected criteria	Application of the exclusion and inclusion criteria defined above..
8	Analysis and evaluation	Presentation of results
9	Critical summary	Discussion of results
10	Presentation of conclusion	Conclusion

Based on the research problem, combinations of selected keywords were tested in order to validate the definition of search descriptors in the databases. The databases used were ERIC (Education Resources Information Center) and BDTD (Brazilian Digital Library of Theses and Dissertations), along with the keywords open educational resources, digital curation, and open education. These databases were selected due to the large volume of relevant studies available for the research topic. Given this context, the selection and identification process began with the analysis of titles that encompassed the study themes, within the specified time period and with a broad focus on the field

of education. For the final selection, emphasis was placed on full-text studies and abstracts that most closely aligned with the research objectives. Figure 3 illustrates the selection stages and the process for eliminating studies that were initially identified.

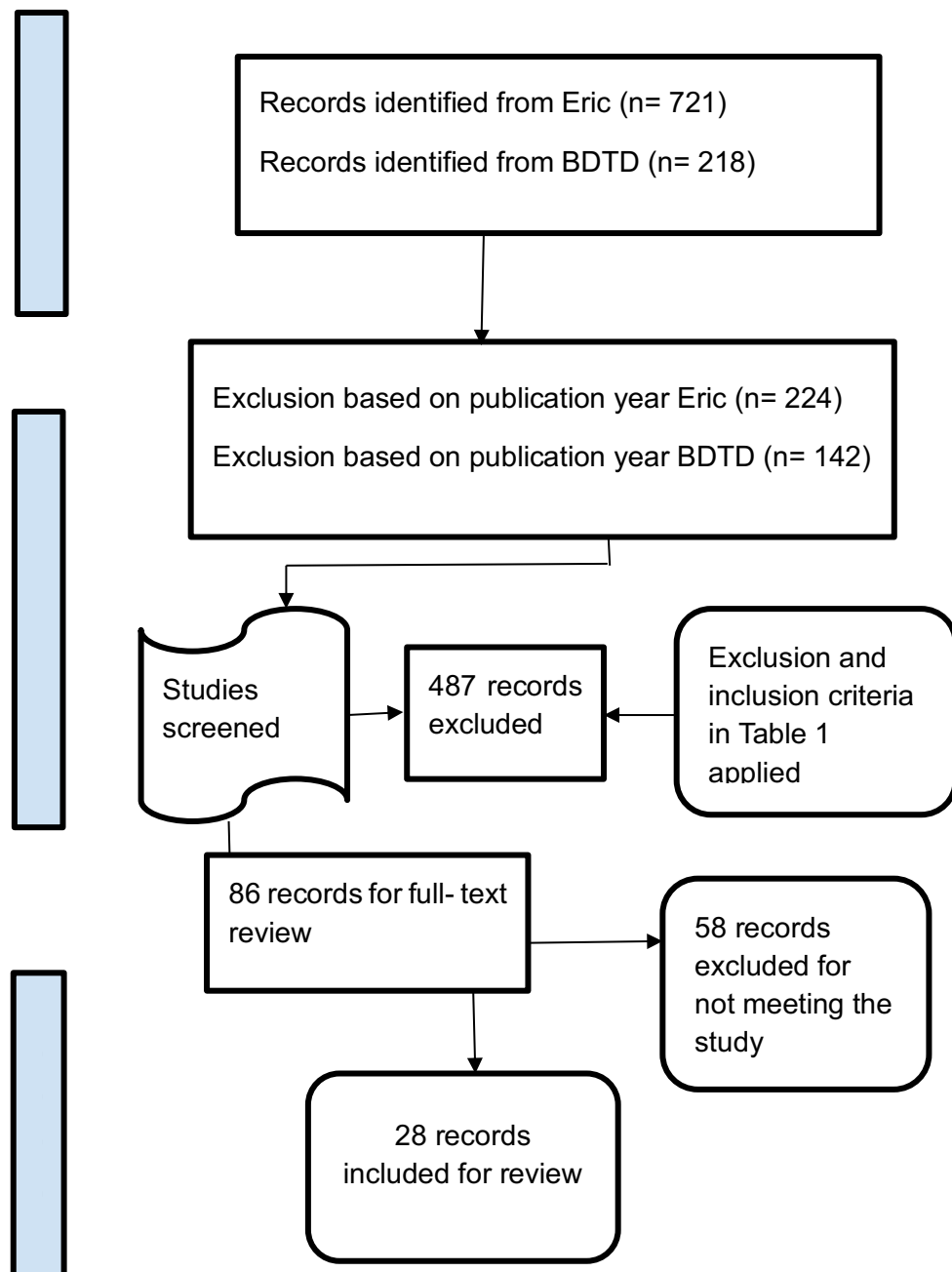


Figure 3- Flowchart for selecting reviews

As presented in Figure 3, the initial search identified 939 records. In order to maintain the feasibility of the analysis, a filtering method was applied using the publication period (2014–2024), which resulted in 497 articles from the ERIC database and 76 from the BDTD database. After applying the inclusion and exclusion criteria (Table 2), 487 records that did not meet the research objectives were removed. A more refined filtering process was then carried out, in which the titles of all studies were carefully reviewed and selected to identify those most closely related to the research object. As a

result, 86 records remained for a full review and analysis, as they aligned with the research objectives. The inclusion and exclusion criteria used in this study are detailed in Table 2.

Table 2- Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
CI1: Studies focusing on Open Education, Digital Curation and Open Educational Resources CI2: Works published between 2014 and 2024 CI3: Studies focusing on educational technologies, education and teacher training	CE1: Studies outside the defined period CE2: Works that do not meet the theme, excluded by titles CE3: Incomplete studies CE4: Studies that do not meet the research objectives, excluded by descriptors and abstracts

Based on the review conducted, 58 records were excluded for not meeting the objectives of the study. As a result, a total of 28 studies were selected for content review, based on their alignment with the research objectives, the study's proposal, methodology, results, and conclusions.

RESULTS AND DISCUSSION

For a more detailed analysis, the results were divided into quantitative and qualitative categories, thus employing mixed methods, according to Creswell and Clark (2013). As shown in Table 3, the quantitative data from the review are presented and organized into thematic areas such as Open Education, Digital Curation, and Open Educational Resources, with a focus on the educational field in basic education.

Table 3. Quantitative analysis of the themes

Themes	Number of Studies
Open Education	3
Open Educational Resources	17
Digital Curation, OER	7
Open Education, OER, Digital Curation	1

According to the data in Table 3, 3 studies showed a stronger relationship with Open Education, while 17 focused on Open Educational Resources (OER), representing the highest number of studies. 7 studies addressed the themes of Digital Curation and OER, and 1 study connected the three themes: Open Education, OER, and Digital Curation.

Chart 2. Qualitative description of the themes

Themes	Description	Authors
Open Education	Studies focusing on mobile devices, teaching and learning, virtual environments, and technology in education	Pujol.P.A. (2017);Berti .M (2019) Abeywardena I.S (2023)
Open Educational Resources	Studies on teacher training, teacher knowledge, education and Teaching and learning educational technology learning objects	Lima. I (2017),Santos. C.N (2017) Jorge.L.K.C(2018),Castro,R.E.(2019) Zangalli.I (2020),Santo.F.É(2021) Orwenjo,D.O e Erastus.F.K (2021) Tlili,A.Zhang,J.Papamitsiou,Z. e Manske,S.(2021),Cossa S.P, Nakala L.P.M, e Cherinda N.A.I.E.P (2021) Asghar.M.Z, Kahyaoglu, Erdogmus.Y, e Saitama.H.P(2021), Arispe K. Hoyer A. e Palmer. K. (2023),Walker. H, Hennessy S. e Pimmer.CH(2023),Arcanjo.E.A.F(2024),Grimm.G.F.H.(2024) Czedrowskil.R.F (2024), Nicolas R. Javier T. Osmany S. Steffany S. e Gisella J. (2024) Klar M. Buntins K.DieckmannI.D. Rittberger M. Kerres M. (2024)
Digital Curation, OER	Studies related to repositories and digital platforms, content curation	Albuquerque M.R (2018), Santos.E.M (2019),Oliveira.L.A.F(2020),Sousa.L.G.V (2021), Adhya,D. e Panda,S(2022) Flores L. Santos. C.e Pedro L.(2024) Hosman L. Nova R. Naji O.A.A.M e Alaska, L.(2024)
Open Education, OER, Digital curation	resource production, teaching and learning processes	Mattos.A.C.G (2023)

Chart 2 summarizes the qualitative studies on the selected themes based on the established criteria and associated with various contexts, particularly their potential for the teaching and learning process, as well as their application to open and sustainable practices. The studies focused on virtual environments, teaching and learning, the use of technology in education, teacher training, digital repositories and platforms, resource production, and content curation. Based on the reviews, we present the answers to the research questions.

RQ1. What thematic areas stand out in the study, and how are they connected to Sustainable Development?

Considering the theme of Open Educational Resources (OER) and the use of technology to produce open resources for the teaching and learning process, this aligns with sustainable development (Czedrowski, 2024). The author investigates the potential of producing and using OER within the classroom context, particularly in science education. Santo (2021) proposes the use of platforms and openly licensed resources for disseminating content aimed at the initial training of teachers, facilitating the sharing of OER and the dissemination of knowledge. The study by Grimm (2024) highlights the importance of collaborative practices in the development and sharing of OER, pointing to the 2030 Agenda as an action plan for collaborative work, with an emphasis on SDG 4. Mattos (2023) underscores the creation of materials from the perspective of OER, Digital Curation, and Open Education, addressing the context of digital culture. The author highlights the creation of pedagogical materials by teachers that reflect a concern for sustainability during the production process, in addition to fostering interactive spaces for the sharing of these constructs. Abeywardena (2023) presents XR technologies as tools for future educational systems, and proposes a framework for the use of OER, open educational practices, and free and open-source software platforms that support strategies for teaching and learning. These approaches contribute to collaborative practices aimed at fostering scalability and sustainability.

RQ2. What gaps were identified in the study through the reviews?

Based on the main themes identified in the content analysis, the study reveals a lack of research that connects the teacher training process with open and sustainable practices in basic education. Furthermore, there is a notable absence of studies addressing public policies and guidelines aligned with the Sustainable Development Goals of the 2030 Agenda particularly SDG 4, which aims to ensure inclusive, equitable, and quality education, and SDG 10, which seeks to reduce inequality (ONU, 2015).

RQ3. How can Open Educational Resources and Digital Curation contribute to inclusive education and sustainable practices in the face of the challenges of the contemporary world?

Open Educational Resources (OER) and Digital Curation are fundamental pillars for building a truly inclusive and sustainable education, especially in the face of the complex challenges of the contemporary world. The inherent accessibility of OER which are teaching, learning, and research materials in the public domain or openly licensed allows knowledge to transcend geographical and socioeconomic barriers. According to the UNESCO definition (2012), OER are teaching, learning, and research materials in formats such as videos, texts, images, animations, simulations, hypermedia resources, digital and non-digital content that are either in the public domain or made available under open licenses with no or limited restrictions on use.

The contribution of Open Educational Resources (OER) to inclusion is evident in their ability to be adapted to diverse needs. Whether for students with disabilities who require specific formats, learners at varying levels of language proficiency, or communities with distinct cultural realities, OER can be modified and remixed. This flexibility is crucial in a globalized world, where learner diversity is the norm. Wiley (2014) emphasizes that the ability to adapt and remix OER enables educators to personalize content to meet the specific needs of their students, something that traditional educational materials rarely provide. Digital curation, in turn, plays a vital role in managing the vast

and ever-growing universe of available information. In a context where misinformation and information overload are pressing challenges, curation ensures that the OER used are of high quality, relevant, accurate, and ethically produced. Teachers and institutions act as curators selecting, organizing, and validating resources which is essential for maintaining academic integrity and trust in educational materials. According to Beagrie (2006), digital curation involves maintaining, preserving, supporting, and adding value to digital data throughout its entire lifecycle.

In the context of sustainability, Open Educational Resources (OER) offer an environmentally conscious alternative to printed textbooks by reducing paper consumption as well as production and distribution costs. Furthermore, their digital nature enables constant updates, ensuring that content remains relevant in the face of rapid changes in knowledge and new scientific and technological discoveries. This capacity for continuous updating and the minimization of physical waste align OER with a global agenda for environmental sustainability.

OER and Digital Curation contribute to strengthening sustainable pedagogical practices by encouraging the dissemination of knowledge. Teachers are encouraged to create and share their own materials, fostering a sustainable educational system that is continually renewed and expanded. One of the major challenges that accelerated the digitalization of education was the COVID-19 pandemic, during which OER and digital curation provided effective solutions. They enabled learning in adverse conditions and empowered communities to reduce educational gaps and address critical issues. These tools are transformative, building bridges toward a more inclusive, equitable, and resilient education system.

RQ4. What main elements should digital repositories and platforms have to support the sharing of open resources through digital curation activities?

In the context of the open movement, it is essential to incorporate tools that enable knowledge sharing. Digital platforms and repositories are databases that must include technical functionalities to store, organize, and manage materials. It is important that they offer open access and open licenses (Creative Commons, 2019), as well as metadata filtering mechanisms that facilitate the location and classification of OER. These resources should be organized by categories such as education level, content, format, and authors. Other important features include compatibility with various file formats, integration with other virtual environments, and multilingual interfaces. These elements support the curation of open resources and promote knowledge sharing.

DIGITAL CURATION PROPOSAL

Based on the studies analyzed, a proposal for Digital Curation was structured with the main elements aimed at assisting teachers in the selection and organization of open educational resources, as presented in chart 3.

Chart 3. Digital curation of OER

Search and select	Identification of OER on digital platforms and repositories
investigate	Evaluation of open resources based on access, quality and licensing
categorize	Organization of OER by theme, content, teaching level and format

Adapt	remixing OER as needed
share	Making OER available in virtual environments with licenses (Creative Commons)
evaluation	Conduct feedback with users to update the curation process

CONCLUSION, IMPLICATIONS AND SUGGESTIONS

This research explored the field of studies on Open Educational Resources (OER) and Digital Curation with the aim of analyzing their contributions to the promotion of innovative and sustainable education, as well as mapping digital platforms of open resources with the intention of proposing a digital curation model for OER. Based on the review of studies and other documents, investigations were conducted to answer the research questions. The findings revealed research gaps in the addressed themes and their articulation with the Sustainable Development Goals in basic education, in addition to the need for teacher training to support open and sustainable practices.

The integration of Open Educational Resources (OER) and Digital Curation seeks to advance pathways toward innovative and sustainable education. OER, due to their open access, adaptability, and shareability, create an equitable educational environment. As a result, they directly contribute to reducing the cost of educational materials, significantly expand access to knowledge, and promote more flexible and personalized teaching practices.

The in-depth analysis of the reviewed articles highlights the importance of OER in the teaching and learning process and in the advancement of educational technology. They are characterized by their use, adaptation, and reuse, promoting the sharing of knowledge. In this context, Digital Curation plays a vital role in maintaining, preserving, evaluating, and re-evaluating digital data, emphasizing the value of these materials.

The limitation of this research lies in the systematic review, which was conducted using two databases: ERIC and BDTD, within a specific time frame from 2014 to 2024. Although these databases are relevant to the topic, the inclusion of additional databases and a broader analysis period could have resulted in a greater number of articles for analysis on OER and Digital Curation. The research primarily follows a qualitative approach, which limits the potential for quantitative depth.

Based on the findings and limitations presented here, future research could include in-depth case studies to investigate the practical implementation of OER and Digital Curation in different educational contexts; the development of frameworks for teacher training in digital curation of OER, aiming to empower educators to act as effective curators; empirical studies to assess the direct impact of curated OER on student performance; and investigations into the effectiveness of existing policies in supporting the development and adoption of OER and digital curation.

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Bridging Design Prototypes: A Design Tool to Resource Sustainable, Equitable, and Flexible Learning

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ABSTRACT

The bridging design prototype (BDP) approach is a human-centred design method used to advance novel educational practice in K-12 and distance higher education, and resource sustainable, equitable, and flexible learning. BDPs are fully functional rapid prototypes of resources/technologies that educators accept to incorporate in real activities with their students. Early adoption of a BDP enables a learning community to participate and play a critical role in a design process, which makes them suitable to investigate needs and emergent practices in a sustainable and respectful manner. This approach is comprised of six principles underpinned by concepts drawn from: human-centred product development, user-centred design, inclusive design, participatory design, and a theory for meaningful learning. The first set of principles help to understand who we are designing for: [1] bring a multidisciplinary team thinking approach to research a learning community and their context; [2] achieve similar mental models to stimulate empathy and solidarity; and [3] understand the prior knowledge and familiar interactions of each member of a learning community. The second set of principles help to implement resource features: [4] make activities simpler to transform difficult tasks into simple ones; [5] broaden participation to counter design exclusion and enhance accessibility; and [6] enable participation in the design process so students and staff can co-create their own educational experience. Through showcasing innovative practice examples, this paper makes the case for using BDPs in open distance education projects seeking community design, scalable bottom-up adoption, decentring external designer participation, and enabling users to become designers.

Keywords

human-centred design; bridging design prototype; community design; bottom-up adoption; decentring designer participation; users become designers; sustainable equitable flexible learning; open educational resources; open educational technology; open educational practice

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INTRODUCTION

Resourcing sustainable and equitable education in flexible learning should start with understanding needs, wants, and context of each member of a learning community. The outcomes of an understanding process can help educators bring about meaningful learning and foster connection with students who could be time-starved, reside outside of main centres, studying while working, caretaking and/or with disabilities. Motivation and retention of diverse students (Cook & Cook, 2023) require changes in how technology is used (Lai & Bower, 2020), curriculum is designed (Bovill & Woolmer, 2019; Vaughan et al., 2023), students understood (Daellenbach et al., 2022), and managing disruption (Garivaldis & Sankey, 2024).

In face-to-face learning experiences, teaching staff more often than not tend to adapt, transform, and innovate resources to account for student diversities. The same tendency should be possible in online learning experience. So, the relevance of these resources to learning outcomes are not devalued by students due to a perceived lack of understanding of their circumstances or conditions. Human-centred design (HCD) has been recommended as a strategy to support digital access and equity (G. Gomez et al., 2022) because it can facilitate the construction of culturally sensitive, accessible, and flexible learning. The bridging design prototype (BDP) approach is an HCD method that design researchers can use to engage learning communities (e.g., educators and students) in experimentations with novel resources, technologies or practices. Some educators have used BDPs as inspiration to implement their own novel educational technology (Kicken et al., 2016). This illustrates that “everybody who works in education is a designer” (Weiner, et al., 2020, p.781) or have the potential to become one.

A BDP is a fully functional rapid prototype that users accept to incorporate in real (not pretended) activities; while designers used them for learning about the context (Gomez, 2020). Its iterative development is informed by six principles from four design methods and one learning theory. The principles enable to:

- Carry out careful analysis of relevant data,
- Develop resources with familiar features to enhance adoption,
- Determine when novel features should be included as part of resource design, and
- Inform feature design based on a good understanding of the prior knowledge, diverse capabilities, and context realities of users.

The BDP approach was developed to enable individual designers or incomplete multidisciplinary teams to apply the full potential of human-centred design when working with limited resources, with difficult to access and technologically dis-inclined communities, and when introducing novel educational ideas without the support of educators or an institution. For these reasons, the BDP approach could work well to advance open educational resources (OER), open educational technology (OET), and open educational practices (OEP) in multiple settings. Particularly in those settings where it is hard to get started, for example one individual (e.g., an educator, a learning designer, a librarian, a student) would like to carry out an open education initiative with limited human, financial, and/or technology resources. The six BDP principles (table 1) can guide the feature development of such novel initiative in a way that their incorporation into existing educational settings do not aggressively challenge the culture, the context, and the practice of a learning community. The design process takes into account accessibility needs, community preferences, and allows for flexible arrangements to take place.

To make the case of using bridging design prototypes to carry out studies and explorations of open education in real settings. Three projects will be introduced in which BDPs have enabled innovative practices to emerge in one K12 and two higher education communities. In K12, a team of primary school educators (with external support from knowledge experts) carried out pilots to study and explore the suitability of a concept mapping method in the teaching of children with speech impairments. In higher education, the BDP approach informed the development of two educational technologies. The first one aimed to enhance participation, engagement, and connection in asynchronous distance education. The second one aimed to provide self-guided online resources to help first year and pre-university students to orientate themselves to university study life.

These three learning communities have carried out interesting activities with the resources or technologies developed. BDPs have not only enabled innovative practices, but also made possible community design, bottom-up adoption, decenter external designer participation, and transformed students and educators into designers of learning. Paraphrasing Cerone and Persico (2014), these outcomes might address what they have described as the gap between the promise of research in technology enhanced learning, and practice in educational institutions, which can only be bridged through the dissemination of a participatory culture of learning design among teachers and decision makers at institutional level (p. 6).

LITERATURE

Five strategies have been recommended to support digital access and equity (G. Gomez et al., 2022):

- Apply universal design for learning to a class where not every learner has access to a laptop or desktop computer.

- Address unequal access to digital content with educational expertise and training.

- Provide digital content in pedagogically sound, equitable and accessible ways.

- Design for long-term high flexibility to accommodate cohort variety, including learners who want to be able to engage when, where and how they choose.

- Include human-centred design in the construction of culturally sensitive, accessible, flexible learning.

Even though placed last, human-centred design could help bring the other four strategies to fruition in a manner that they relate to a particular learning community, educational institution or organization.

Human-Centred Design and Open Education

From an engineering perspective and according to ISO 9241-210:2010(E), “human-centered design is an approach to interactive systems that aims to make systems usable and useful by focusing on the users, their needs and requirements, and by applying human factors/ergonomics, and usability knowledge and techniques. This approach enhances effectiveness and efficiency, improves human well-being, user satisfaction, accessibility and sustainability; and counteracts possible adverse effects of use on human health, safety and performance” (<https://www.iso.org>). In the last two decades, this approach/methodology has evolved and informed a great number of design approaches (including Design Thinking), and its use has been expanded from products into services and systems, with examples of its application in many fields. The term has evolved to mean “[HCD] uses techniques which communicate, interact, empathize and stimulate the people involved, obtaining an understanding of

their needs, desires and experiences which often transcends that which the people themselves actually realized” (Giacomin, 2014, p. 610).

In open education projects, HCD has been used as a methodology to guide educational technology projects throughout (Devi & Guterres, 2022; Garcia-Lopez et al., 2020), inform the development of open education technology principles (Kahle, 2008), and the development of recommendations putting learners and educators at the centre of any process or activity related to teaching and learning (Belhadj, 2025). These projects have been carried out either within a university environment or by a non-profit organisation with funding and support from management and community. They seem to have taken a systems perspective (Buchanan, 2001; Weiner et al., 2020) into conceptualising, prototyping and implementing open education solutions to address educational issues which is highly recommended for sustainable uptake of innovations (Cerone & Persico, 2014; Heller, 2021).

Particularly in the last decade, expertise in HCD is widely sought by companies and non-for profits. It is implemented in industry, government, non-for-profit organisations, and educational institutions. However, it is quite difficult to implement it without methods and tools that an individual or small team can use to carry out an iterative design process, as it requires human, financial, technical, and time resourcing (Giacomin, 2014; Norman, 1999).

Bridging Design Prototypes: Definition, Origins, and Characteristics

The bridging design prototype (BDP) approach is a human-centred design method for individual designers or small organisations with incomplete multidisciplinary teams and limited resources. The author developed it to carry out studies and explorations in real educational settings to advance novel educational practice from an interaction design perspective, with difficult to access and technologically dis-inclined user communities (Gomez, 2010, 2020). Since then, this approach has consistently been used to advance novel educational practice and actively engage communities in the design process of their own initiatives. People doing or wanting to carry out open education development projects with similar constraints might find it a suitable option.

A BDP is a fully functional rapid prototype built with features familiar to a user/learning community and with novel features a designer (researcher, and or R&D team) incorporates after careful analysis of relevant data. It capitalises on a user community’s prior knowledge (i.e. the knowledge a user already has about a situation or an activity and embodied in theories, techniques and instruments) and recognises their context realities. These characteristics bring community members (e.g., educators) early into the development process because they accept to incorporate it into their real activities (e.g., students). At the same time, individual designers (researcher, and or R&D team) use it for learning about the community, the context, and the practice (Gomez, 2009; Gomez & Tamblyn, 2012b). Early adoption of a BDP enables every community member to participate and play a critical role in a design process, which makes them suitable to investigate emergent practices sustainably and respectfully. The learnings can become case studies and explorations for the advancement of novel educational resources, technologies and/or practices.

BDPs are experience prototypes (Coughlan et al., 2007) and provotypes (Mogensen, 1991). Experience prototypes emphasise experiential aspects while provotypes are used to provoke reaction and insights. The main difference with these also rapid prototypes is that BDPs must be fully functional rapid prototypes and experimentation should not require the presence of designers. By functional, it means all features should operate, and users should be able to implement them in real activities.

But these are not necessarily minimum viable products, as the digital or tangible materials with which they are built could have a limited lifespan (see BDP projects and respective designers in Gomez, 2022, p. 43). They enable researchers and professionals to engage with educational user communities in their own terms and to explore learning situations not possible before due to curricula or environmental factors. Applications outside my own practice can be found in projects by graduate students in interaction design, primary education and mathematics (Marín Ortiz, 2017), and in product development and innovation (Gomez et al., 2020).

Table 1: Principles and underpinning concepts of the BDP Approach

The Six Principles of the Bridging Design Prototype Approach	Underpinning Concepts Drawn from Four Design Methods and a Learning Theory
Principle “Develop a human-centred design study that brings a multidisciplinary thinking team approach to research the learning community and their context ”	“Human-centered product development process” (Norman, 1999): Design a human-centred design study with approximate research methods including primary and secondary sources and rapid prototyping techniques.
Principle “Becoming more empathic through the designer, R&D team and the learning community achieving similar mental models ”	User-centred design concept: ideally the user’s mental model and the designer’s conceptual model of a system image should be equivalent (Norman, 2002). The language (signs and symbols) chosen to communicate the appearance, actions, and operations of a system image (e.g., resource, technology) should enable every member of the learning community to make the correct interpretation of a mental model
Principle “Deep understanding of the prior knowledge and familiar technological, behavioural, and social interactions of the learning community”	Conditions for meaningful learning: the learner must have prior knowledge , and the learning must be prepared with familiar languages so the learner is motivated to learn (Ausubel et al., 1978). Prior knowledge may take the form of: Familiar languages and familiar interactions • Preferences, needs, skills • Cognitive, physical, and social factors • Environments, values, ideas, context of use
Principle “Development of features that make activities simpler ”	User-centred design concept “seven principles for transforming difficult tasks into simple ones” (Norman, 2002): Exploit natural properties - people, world, relationships, constraints • Exploit constraints - physical, semantic, cultural, logical • Use mental aids - reminders, automation, change nature of task • Actions should match intentions/expectations • Make outcomes of actions obvious • Provide timely feedback • Design explorable systems/products • Exploit forcing functions (kind of actions) • Standardize actions, outcomes, layout, displays
Principle “Development of features that broaden participation ”	Inclusive design approach concepts (Keates & Clarkson, 2003): Requirements should be inclusive of every member of a user/learning community • Counter design exclusions and accessibility • Meet the user social acceptability attributes • Meet the user practical acceptability attributes

Principle “Implementation of a prototype for early adoption enabling the learning community to participate , contribute, improve features in the design process ”	Participatory design concepts: users become participants and play a critical role in a design process (Spinuzzi, 2002; Suchman, 1993) • Users’ participation early in the front-end is needed to drive truly human-centred product development (Sanders & William, 2002)

Principles And Previous Applications In Education

The BDP approach is comprised of six principles underpinned by seminal concepts drawn from four design methods and one learning theory (table 1). It emerged during my doctoral research and enabled the development of a BDP that educators would accept to incorporate in real activities with their students. Figure 1 presents a step-by-step guide showing how the BDP principles are organised and interact with each other during the human-centred design process of an educational resource (adapted from Gomez, 2022, p. 40).

The first set of BDP principles “bringing a multidisciplinary thinking team approach”, “achieving similar mental models” and “understanding prior knowledge and familiar interactions” (figure 1a to 1d) help to implement an HCD study to understand needs, wants, and context of the learning community. The second set of BDP principles “making activities simpler”, “broadening participation in the design process”, and “enabling participation in the design process” (figure 1e to 1i) guide the implementation of design features. Table 1 introduces the BDP principle and its underpinning seminal concepts. The iterative cycle of a BDP approach (figure 2) fleshes out the process of idea generation, prototyping, testing and observations. The goal is to develop a fully functional rapid prototype that a learning community accepts to incorporate in real settings.

As introduced earlier, the BDP approach was developed to advance studies and explorations in novel educational practice from an interaction design perspective. Interaction design is defined as “... the study and exploration of how people relate to other people through the mediating influence of products...” (Buchanan, 2001; 2005, p. 5). Therefore, it helped to identify what shape features of a resource or technology (i.e., a product) should take to enable one group of people (educators and administrative staff) to relate to another group of people (students). Described in some detailed in the next section, the BDP principles helped to:

- Advance concept mapping in preschool and primary education through the Authoring Kit for Preschool Concept Mapping (the Kit)
- Enhance engagement and connection in online academic study with an educational technology called OceanBrowser 3 (OB3)
- Support the development of a website with self-guided online resources to help first year students to orientate themselves to university study life. This project was called “Getting Ready for My Otago First Year” (MOFY)

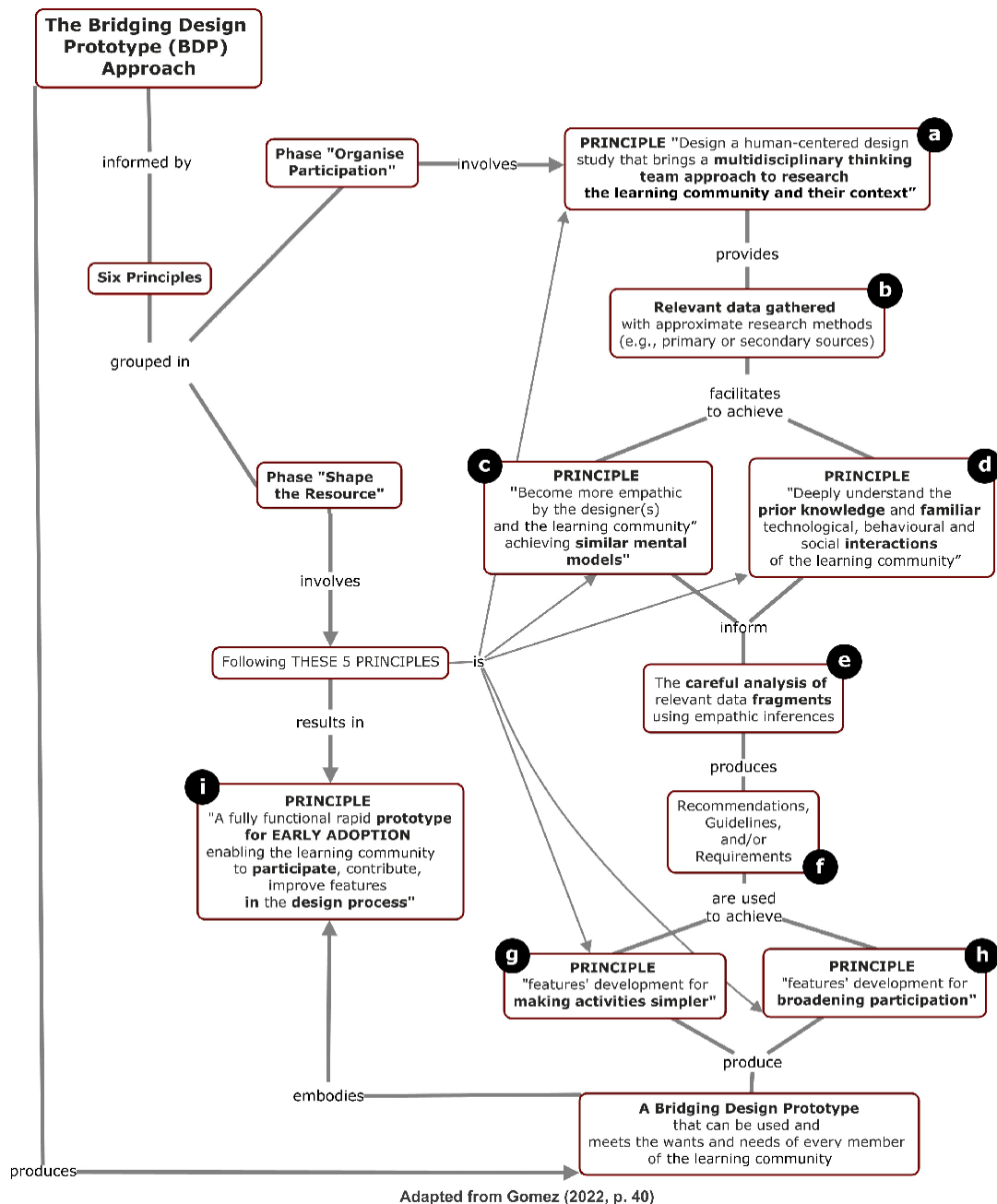


Figure 1: A step-by-step guide showing how the BDP principles are organised and interact with each other during the human-centred design process of an educational resource (Gomez, 2022).

ENABLING LEARNING COMMUNITIES TO CARRY OUT THEIR OWN RESOURCE DESIGN

The BDP approach was used to implement an age-appropriate concept mapping tool for preschool children. The first set of BDP principles “bringing a multidisciplinary thinking team approach”, “achieving similar mental models” and “understanding prior knowledge and familiar interactions” (figure 1) informed an HCD study to understand needs, wants, and context of the early childhood community in Australia and New Zealand. Initial observations were not possible, therefore primary

and secondary data were collected via: (1) conversations with key experts at different prototyping stages via informal meetings, phone calls, email communication and at seminar/conference events, (2) reviews of visual material found in books or the internet to learn about early childhood learning spaces and identify materials that teachers and children found easier to operate, and (3) literature reviews on preschool concept mapping, how children learn, child cognitive development, and multiliteracy development.

A deep understanding of the prior knowledge as well as the familiar technological, behavioural and social interactions of children and teachers in early childhood settings was achieved through using the data gathered in the rapid prototyping of sketches, mock-ups, storyboards, and interactives (figure 2). Empathic inferences (Fulton Suri, 2003; Postma et al., 2012) of selected data fragments (figure 1) helped to put together design guidelines and requirements for a BDP that make sense for children and teachers alike (Gomez, 2009). The careful analysis of relevant data helped lessening the gap between my conceptual model of the system image (i.e., should the BDP be a digital or tangible resource) and the mental model teachers had of young children not being developmentally ready to make concept maps.

The second set of BDP principles “making activities simpler”, “broadening participation in the design process”, and “enabling participation in the design process” guided the implementation of features (figure 1) of a tangible BDP so preliterate, emergent writing children, and teachers could use it together in the classroom space (Gomez, 2009). Based on data gathered on common functional capabilities, cognitive and social factors of teachers and children, a decision was made to add a design guideline to “enable teachers to diversify instruction”. The other three guidelines focused on the children’s needs and capabilities: children learn through play, hands-on, and concrete exploratory activities, scaffold children’s control over relevant cognitive skills so they can retain, organize and self-regulate conceptual knowledge, and support the use of multiliteracy during concept labelling so they can represent any conceptual idea.

Thirteen requirements guided the prototyping process arriving at this BDP (also known as the Authoring Kit for Preschool Concept Mapping or the Kit). It was comprised of materials commonly found in the classroom (construction paper, markers, whiteboard, magnets) and one innovation, commercially available voice-recorders (vrecorders). A vrecorder enables a 10-second voice message to be recorded that can be played back up to 500 times, and is small enough that can be held and operated by a preschool-age child. All these materials were re-purposed, re-designed, and/or assembled to create structuring features that support and improve children’s authoring at the moment of labelling, representing and relating concepts (ideas, thoughts) with symbolic and/or verbal language. Its features are adaptable to use with individual children or groups, to build pre-constructed maps or low-directed maps. By providing adaptable features, the BDP/Kit was converted into a design tool that fosters participatory design (Suchman, 1993).

Once this BDP entered real school settings, teachers and children had an opportunity to influence and transform its design. It helped me (the designer) gain entry to real settings and made it possible to investigate issues in preschool concept mapping from an interaction design perspective (Gomez, 2010). Outside of my own research, early childhood experts have used it to inform their own concept mapping research on metacognitive skills and science education (Cassata-Widera, 2008; Cassata-Widera, 2009) or promote bottom-up adoption of concept maps as a new didactic tool to teach children with speech impairments (Kicken et al., 2016).

A critical reflection (Gomez, 2020) on the work of Kicken et al. (2016) showed that BDPs might be useful in projects seeking community design, bottom-up adoption, decentring external designer participation, and enabling users to become designers (Lee, 2008). Speech therapists, counsellors, and teachers adapted my BDP for preschool concept mapping (Gomez, 2010) for teaching interactive language learning to children with severe speech language difficulties. Furthermore, they could adapt it, modify it, and one teacher, replaced it with a completely new design, a tool for the Interactive Whiteboard. Three pilots were carried out in three years with escalating numbers in teacher and children participation and duration: an afternoon-pilot (two coaches and three children), a five-month pilot (two coaches, five teachers and their students), and a one-year pilot (18 groups with teachers of the middle and upper grades and their children age 6-12).

This learning community's re-orientated and modified the Kit, inspired them to implement their own educational tool and convince management to support and resource the pilots. Explorations excited colleagues to join in adoption because they saw their students improving learning with the new didactic tool. Even though this project was not carried out within an OE paradigm, OE characteristics were observed due to the way the community advocated, worked together and navigated the school politics to achieve their aims. Havemann and colleagues' quote seems fitting to explain what happened "advocacy for Oe policy is a politics of working to influence, shape and transform educational systems, organisations, processes and practices towards equity and inclusion" (Havemann et al., 2023, p. 310).

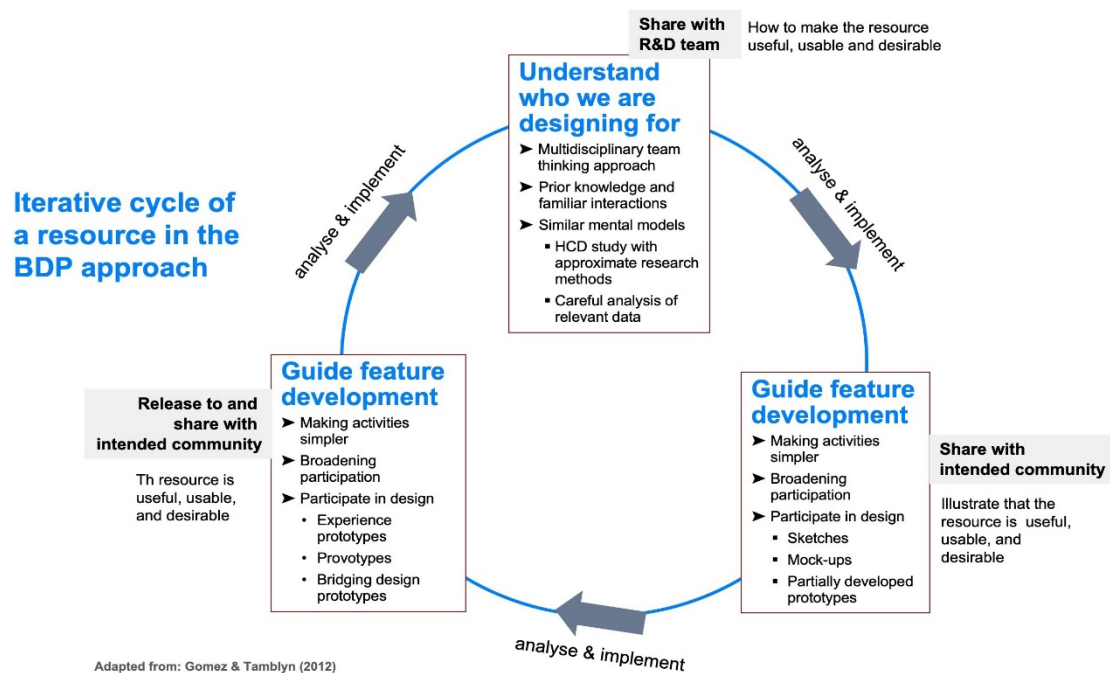


Figure 2: Iterative cycle in process seeking to implement bridging design prototypes

ENHANCING ENGAGEMENT, FEEDBACK, AND CONNECTION IN ASYNCHRONOUS DISTANCE EDUCATION

The BDP approach was used to develop OB3 with the aim of addressing issues in asynchronous online education around student engagement and isolation. It is adopted in programmes catering to students who are older and want to access quality education from where they work or live.

The first set of BDP principles “bringing a multidisciplinary thinking team approach”, “achieving similar mental models” and “understanding prior knowledge and familiar interactions” (figure 1) helped to implement an HCD study to understand needs, wants, and context a learning community studying online, asynchronously and at a distance in higher education. Primary and secondary data were collected via: (1) company documentation, (2) informal conversations, conference presentations, and seminars organised together with existing clients, (3) a published case study on the use of concept maps in postgraduate distance education (Gomez et al., 2014), (4) literature reviews on educational design for university study skills, metacognition and good visual design, networked learning, knowledge representation, a review on e-learning in medical education and of published reports on the use of other e-learning tools or comparisons between tools (Gomez & Petsoglou, 2021; Gomez & Tamblyn, 2012a, 2012b).

A deep understanding of the prior knowledge as well as the familiar technological, behavioural and social interactions of educators, students and administrative staff was achieved through the data gathered. They offered explanations to understand the tasks educators and students undertake with content online and identify the interaction design issues preventing effective online course delivery or online study sessions in discussion forums. Empathic inferences of selected data fragments (figure 1) helped identify some issues such as poor forum participation, educators’ strong dependence on OB technologist to update online content, educators finding daunting the diverse technologies needed to teach online, student assignments prepared last minute (Gomez & Tamblyn, 2012a). The careful analysis of relevant data helped lessening the gap between my conceptual model of the system image and the mental model of educators and students. Students and lecturers (in the health professions and medicine) and administrative staff can be distributed globally, have limited computer skills, and little or no time to learn new skills (Gomez & Tamblyn, 2012b).

The second set of BDP principles “making activities simpler”, “broadening participation in the design process”, and “enabling participation in the design process” guided the implementation of OB3’s feature design (figure 1). Data gathered on common functional capabilities suggested to lower technology adoption barrier and broaden age-groups participation: lecturers, students, and administrative staff including those over age 60+ were time starved and had little time available to learn new technological skills (Gomez & Tamblyn, 2012b; Petsoglou & Stoop, 2020). Therefore, two novel changes in interaction design were made. *In the first change, educators and students can author media-rich content with familiar skills in a same interface* that also de-emphasises administration. Content within an OB3 document is authored capitalising on familiar interactions (e.g., commands: cut, copy, and paste; drag and drop) with MS Office, internet browsers, and email applications. Novel behaviours include automatic inclusion of hyperlinks, videos, audio-recordings, tweets, surveys, google docs, etc. *In the second change, students engage in asynchronous discussions with educators or peers via discussions embedded inside lecturing or assignments documents.* In an OB3 document, they can start discussions under any element (i.e., heading, paragraph, quote, image, video or audio-recording) and contributions to discussions can be in the form of text, images, videos and/or audio-recordings (Gomez & Petsoglou, 2021).

The novel changes in interaction design make OB3 easy to adopt and immediate benefits in the lecturer- student connection can be experienced. Over time, these connections deepen into a wide range of collaborative activities between learners. This interactive platform [1] enables students and lecturing staff to co-create media-rich resources that promote active learning, critical thinking, and

reflection; [2] fosters learning relationships among students and with educators to reduce dropout rates; and [3] allows students to share, feel connected and work together with resources curated by lecturing staff. OB3's functionality reduces administrative tasks, offers more autonomy than traditional LMSs, and connects multiple organisations (e.g., education providers and workplaces). The system tracks down individual contributions for author attribution and assessment. These changes in study behaviour are not only well suited for independent, lifelong, and self-directed styles of learning, but also transform teachers and students into co-designers, and created opportunities for educators to re-think their role (Gloria Gomez et al., 2022).

This technology has enabled health professions educators (in midwifery and ophthalmology) to carry out "co-creation *in* the curriculum" that is co-design of learning and teaching within and the duration of the course (Bovill & Woolmer, 2019). Student-led assignments can be in the form of asynchronous online journal clubs and wiki projects provide opportunities for students and academic staff (Gomez et al., 2024; Petsoglou & Stoop, 2020). Work placement experience discussion documents promote connectedness and network learners with other learners, and with lecturers and experts (Daellenbach et al., 2022).

The continuous use of the BDP approach in OB3's further development has helped to fine-tune understanding of its learning community. Some distance educators teach using active learning and participatory approaches, seek inter-institutional collaborations, co-create learning and seek lifelong learning engagement with their students through giving access to alumni to content and particularly their own study content and co-created with others in the course (Daellenbach et al., 2022; Petsoglou & Stoop, 2020). These ways of teaching and learning are in-line with open education pedagogy. The BDP approach can be used to carry out studies and explorations to identify OER and OEP models and approaches that:

- Work in the current climate of higher education "reduced funding" and "increasing adoption of online education" and "get serious about using Open Educational Resources, and researching the appropriate place in education practice" (see Heller, 2022, p. 61).
- "Oep involves the opening of educational communities and processes, to enact solidarity, enable informal learning, sharing, collaboration and co-production." (Havemann et al., 2023, p. 310)

GUIDING A LEARNING COMMUNITY IN THE IMPLEMENTATION OF AN ONLINE RESOURCE

The implementation of a BDP to support the first-year student experience was produced during a seven- month fixed-term contract as educational designer. The aim was that academic and support staff could update and improve it with little or no expert design assistance over time.

The first set of BDP principles "bringing a multidisciplinary thinking team approach", "achieving similar mental models" and "understanding prior knowledge and familiar interactions" (figure 1) helped to implement an HCD study to understand needs, wants, and context of the learning community to help students' introduction to the new environment of academia (Gomez & van der Meer, 2010). Primary and secondary data were collected via multiple sources: (1) student interviews on first-year experiences, (2) conversations with academics teaching first-year students and student note-takers, (3) conversations with student learning centre staff, and (4) review of secondary sources

on academic self-efficacy (Bandura, 1986), self-directed learning and guided-discovery instruction (Novak, 1998; Piskurich, 2015), and a PhD thesis on first-year students making sense of the challenges and the teaching environment (van der Meer, 2008; van der Meer et al., 2010).

A deep understanding of the prior knowledge as well as the familiar technological, behavioural and social interactions of students, academic and support staff was achieved through data gathering activities (conversations, interviews, attending tutorials, producing resources, etc.) and empathic inferences of selected data fragments (figure 1e). My empathy and solidarity as a designer emerged from engaging meaningfully with students and staff, which helped lessening the gap between their mental models and mine during the development of suitable features for students (e.g., use student voice and guide students into self-teaching), academic and support staff (e.g., build on familiar technologies and approaches).

The second set of BDP principles “making activities simpler”, “broadening participation in the design process”, and “enabling participation in the design process” guided the implementation of features (figure 1g-h) of self-guided online resources to help first year and pre-university students to orientate themselves to university study life. Based on data gathered on common needs and capabilities as well as familiar technologies, a decision was made to implement website and online resources with technologies that student advisors and support staff were proficient in using, so they could carry out website and resource updates without external expert support. Today these resources will also have to comply with accessibility standards and address the needs of mature and disabled students.

The self-directed approach to learning (Novak, 1998; Piskurich, 2015) chosen for resource development required a slow introduction of the topics through small sets of goals on the aspects contributing to academic success: effective self-efficacy beliefs, necessary subskills, and appropriate social and physical conditions. The literature review and conversations with students and staff helped identify topics for the website: high school vs university experience, what to expect from lectures, seminars, tutorials and laboratories, university study strategies, subject specific skills, setting realistic goals, future time perspective, study habits and learning styles, preparing for assessment, seeking help, motivation, study and social life, mental well-being. A webpage per topic introduced how-to information in the form of an interview, video, quiz, and/or online tutorial. Content was created using magazine writing style: informative, short, concise, like if someone was talking to you personally.

The approach taken to resource production made possible to co-create. Academic and support staff produced how-to videos (e.g., doing oral presentations, writing skills, etc.). Short videos were produced on more senior students explaining how-to take lecture notes or sharing aspects of their first-year experience. Two senior students were recruited to interview their peers using questions developed based on identified topics.

This BDP project is in the line of Shea’s project that involved student-led development of videos. This project started with one pilot in which the framework and approach with educators and librarians was generated, and then through small successes the project continued for multiple years and producing OER videos on agricultural resources (Shea, 2020). This project is an example of a librarian working closely with the educator leading the course, implementing an approach to resource development, with limited resources, that is scalable, sustainable, and bottom-up participation.

CONCLUSION, IMPLICATIONS AND SUGGESTIONS

The BDP approach has provided a framework for prototyping resources that engaged educators, students, and support staff in experimentations that had the potential for meaningful learning and connection. This framework could be used by individual people doing studies, explorations and experimentations of OER and OEP, in conjunction with other methods and perhaps with limited resources. For example, it would be interesting to explore how it would operate alongside the open technology design principles (Kahle, 2008). For the reason that a BDP project can start small. As illustrated, it could potentially attract the participation of many people within a learning community, if the principles are applied to implement tools that can be incorporated into real settings for these to be advanced by educators and students in their own terms. If communities are involved from the start, BDPs could be produced in a co-design manner (e.g., OB3 and MOFY). If intended communities are involved later, the external designer(s) must develop a first BDP for gaining entry to the community setting, so a co-design process could be started (e.g, the Kit).

The BDP approach could [1] guide open education projects carried out by individual designers, educators or small incomplete disciplinary teams eager to get going in spite of limited resources; [2] promote sustainable innovation (Cerone & Persico, 2014) and microinnovations (Saariluoma, 2011) that over time show sustained, scalable, and bottom-up impact ignited by learning communities; and finally [3] could add a practical side to “continued research and reflection on [current and emergent] themes to enhance the effectiveness and inclusivity of flexible learning practices” such as the educational design skills gap, the balance of autonomy and support in flexible learning environments, socio-economic disparities that affect access to education, and the rise of AI (see Atkinson & Fields, 2024, p. 1).

Activities with BDPs of open educational resource, practices or systems could facilitate exchanging ideas for inclusive, scalable and sustainable education because they have been designed with the objective to be used and transformed by the open education community that these have been designed for. If suitably designed following the BDP principles (figure 1), inclusive, sustainable and bottom up uptake of a resource, practice or system will be possible, which are characteristics central to the futures of global higher education (DeRosa & Robison, 2017; Heller, 2021).

AUTHOR NOTES

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Author's Contributions

Gloria Gomez: Conceptualization, methodology, investigation, visualization, writing—original draft preparation, writing—review and editing. The author has read and agreed to the published version of the manuscript.

SUSTAINABLE DEVELOPMENT GOALS (SDGs)

This study is linked to the following SDG: Quality education (SDG 4).

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AI Chatbot in an ODFL Learning Environment: A Trial

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ABSTRACT

A substantial portion of the literature on the use of generative AI in higher education centres on its use in face-to-face teaching environments and concerns about academic integrity, particularly plagiarism. Studies have also discussed the potential of GenAI in education, such as enabling personalised learning. However, few education providers have conducted empirical studies on the implementation of GenAI tools in authentic learning environments. The implementation of generative AI in online, asynchronous vocational education has received even less attention. This study aims to address this gap by providing empirical findings from students' interactions with an AI-enhanced chatbot, Oppy, piloted at the Open Polytechnic, an Open, Distance, and Flexible Learning (ODFL) provider of education in New Zealand. By addressing this underexplored area, this study seeks to contribute valuable insights to the limited body of knowledge on the application of AI in ODFL environments. The survey results of a three-month pilot in three courses showed most respondents were optimistic about AI's potential to improve their learning. However, chat log analysis revealed low overall engagement and limited usage of the chatbot's capabilities. The trial also highlighted risks, including off-scope use, ethical breaches, and cultural sensitivity issues. Findings suggest that without targeted instructional design, training in effective prompting, and clear guardrails, the educational value of AI assistants in ODFL settings is limited. Recommendations include integrating AI interaction points into courseware, providing exemplar prompts, and aligning tool capabilities with pedagogical goals to enhance adoption, learning outcomes, and responsible use.

Keywords

Generative AI; AI chatbots; online distance flexible learning (ODFL); instructional design; learner engagement; prompt engineering; task-technology fit; educational technology adoption; use of AI in education; vocational education

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INTRODUCTION

The use of Artificial Intelligence in education has been discussed extensively in the literature following the release of ChatGPT to the public. More specifically, the use of chatbots to assist learning, at least theoretically, appears attractive to many online education providers. Having an assistant who can answer students' queries at their convenience sounds enticing even to the educators themselves. Releasing a chatbot endorsed by the institution, however, poses significant risks related to ethical use. It also raises cybersecurity concerns, as well as development, deployment, and maintenance costs. Although the benefits and risks are discussed in the literature, research on the practicalities of AI chatbot use in online education still has gaps to be filled.

The Open Polytechnic of New Zealand is a fully online vocational education provider enrolling around 27,000 students annually (Open Polytechnic, n.d.-b). The teaching is delivered remotely and asynchronously using a bespoke learning management system. The student body is supported by student success advisors, mentors, the library, accessibility services, and the course leaders. Content acquisition is facilitated by the course leaders, who answer content-related queries. Thus, the question of whether effort should be committed to creating an AI assistant to integrate it within the learning management system prompted a trial.

The goals of this research project were to:

- a. analyse the learners' behaviour around AI chatbots
- b. assess risks associated with the use of AI in education (including plagiarism)

The key assumptions of the researchers and the executive team of the Open Polytechnic alike resided on the presupposition that the learners:

- a. expect the institution to utilise digital tools in the delivery of the course content
- b. have some familiarity with the tools used in online delivery of the content, such as the public and private talk channels for interactions, and the tools used for completing interactive activities, and hence would not be averse to using a chatbot
- c. will be motivated to use the bot to improve their learning.

In this paper, we discuss the trial design, results of the entry surveys completed by the participants to gain access to the chatbot, feedback from the exit survey, and examine the patterns of behaviour evident from the analysis of the logs.

LITERATURE

Literature on the use of generative AI in higher education is emerging fast, including systematic reviews and publications by major academic publishers. The publications reviewed so far can be classified as follows:

(i) General Overview of Generative AI Impact on (Higher) Education

Several studies provide broad discussions on the implications of generative AI in education. For example, Chan and Colloton (2024) offer a comprehensive overview of generative AI in higher education, including ChatGPT. Their analysis spans all modes of instruction, exploring various risks, challenges, and opportunities associated with AI integration.

(ii) Systematic Reviews of Literature on Chatbots in Education

Systematic reviews summarise a body of knowledge on the use of AI chatbots in education periodically and are a valuable source of research conducted in the field. In general, the papers reveal that the state of the field is rich in theoretical papers and discussions on the risks and ethics of AI use, but poor in hard data drawn from empirical research.

As pointed out by McGrath et al. (2024), empirical studies segregated into distinct educational settings are limited in scope for drawing convincing conclusions. The literature review suggests that out of 23 papers on AI in higher education published since ChatGPT's public release in November 2022, seven were a result of an experiment. Of these, only four focused on chatbots. Of these four, three are about chatbot performance rather than patterns of student interaction with technology, and all papers examining students' motivation for using AI chatbots have used methods other than empirical studies. Furthermore, of the papers published on this subject, very few relate to online distance learning. Vocational education is another angle that relatively few publications cover.

Thus, the intersection of the fields of GenAI in higher education, vocational education, and ODFL (Open Distance and Flexible Learning) does not provide many papers with tangible research outcomes to base business initiatives on.

(iii) Theoretical Exploration of Chatbots in Education

A substantial portion of the literature consists of theoretical discussions rather than empirical investigations. While these papers contribute valuable perspectives on pedagogical frameworks and ethical concerns, they lack practical data on how students engage with AI chatbots in real-world learning environments.

KNOWLEDGE GAP

Overall, despite a surge in publications on generative AI, research on its practical use in education remains limited. Most studies focus on face-to-face teaching environments and concerns about academic integrity, particularly plagiarism detection. However, the role of generative AI in online, asynchronous vocational education has received far less attention. Additionally, few education providers have conducted robust empirical studies in authentic learning environments on the use of GenAI tools since ChatGPT and similar free-to-use AI chatbots have become widely available (2022–2024).

THIS RESEARCH'S CONTRIBUTION

This study aims to fill this gap by providing empirical data on student interactions with an AI-enhanced chatbot trialled in an online learning environment. Unlike prior research that has primarily evaluated chatbot performance, this study focuses on students' behavioural patterns and engagement with AI. By addressing these underexplored aspects, this research contributes valuable insights to the growing body of knowledge on AI in higher education. The findings from this research aim to inform the development of the Open Polytechnic AI chatbot as a learning tool for students within the polytechnic's learning management system, iQualify.

RESEARCH METHODS

This research is an empirical study that investigates patterns of use of a chatbot by learners embedded within the learning management system and with access to courseware.

The study uses a mixed method approach employing a quantitative survey, analysis of the logs of the conversations between each user and the AI assistant, and a qualitative interview approach. The mixed method design was used to validate the self-reported survey data against the actual behaviour demonstrated by the students when using the AI assistant.

The courses used for the study were deemed fit for the trial. The course selection criteria were: a) Learners of varied age and social group; b) medium to high enrolment numbers, c) availability of historical data (not a new programme) as a benchmark, d) duration of the learning programme exceeding the duration of the trial to minimise risks to overall student performance (e.g., not a micro-credential or a certificate of completion); e) the facilitator is involved in the research.

Courses matching the criteria were: BSNS5003 Business functions, 71245 Organisational behaviour, and 71231 Marketing.

There were 258 students enrolled in the above courses of the February to June 2025 blocks were invited to participate in the entry survey and gain access to the AI assistant. The entry survey was designed to collect data on the respondents' demographics and previous experience with generative AI technology. The entry survey also contained a section where the participants gave their informed consent to the chat logs used for research purposes.

After installing the AI assistant, the learners could use it until the end of July 2025. The exit survey at the end of the trial was designed to allow the participants to reflect on their use of the tool and provide feedback on their experience.

The unscripted interview was used as an opportunity for the participants to highlight the most prominent elements of their experience unprompted. The participants were motivated to complete two surveys and the interview with a chance to enter a draw for a \$100 (NZD) supermarket voucher.

AI Assistant: Technology

The AI assistant prototype, called Oppy, was developed by the Technology Lead in Learning Design and Development directorate and functions as a Chrome extension compatible with Chrome and Edge browsers on PCs and laptops (excluding tablets, smartphones, and other mobile devices). This application interacts with students via a pop-up chat interface, enabling unscripted, natural language conversations. Course content informed the context for the assistant. The assistant would analyse the webpage metadata and identify the active page and the course. The model used at the backend is ChatGPT 4, a pre-trained LLM. System-level prompts instruct this bot to provide responses based on the courseware and reference the course pages at the first instance, before making use of common knowledge. The prototype was trained to engage in a Socratic dialogue rather than provide straightforward answers.

The purpose of the chatbot was to provide the learners with a reliable generative AI-based application that has access to the course they are studying and utilises a more sophisticated model than available on a free-to-use basis. The chatbot can be used to inquire about the topics the learner is studying, as an informed partner for ideation, and as a tool to generate variations of the course tasks. This aims to improve learners' engagement with the courseware and provide them with an opportunity to reinforce passive exposure to course content by active participation in a dialogue with the assistant. Moreover, the chatbot can be used to improve comprehension of the course content by simplifying it and providing a summary. The assistant was intended to be a safe way for the learners to explore generative

AI and its capabilities without exposing their personal information, student-generated content, or the Open Polytechnic intellectual property to risks by uploading these into general purpose free-to-use models.

Data Management and Storage

Entry and exit surveys were conducted using Microsoft Forms with branching scenarios. For the entry survey, the learners first answered the questions on their age, familiarity with the generative AI tools, and their level of comfort adopting new technologies. The institutional email address was captured to provide the user with permissions to access the AI assistant. At the end of the survey, the participants had an option to participate in the trial, thus giving the research team their permission to analyse the chat logs generated as a result of their AI assistant use. If the participant chose “No” in the consent form, the survey ended. Otherwise, the participant could access the instructions on how to download and install the Chrome browser extension.

Exit surveys were conducted using Microsoft Forms with branching scenarios accommodating two types of participants: those who used the AI assistant and the ones who consented to using it but ended up not engaging in any conversation with the assistant. The first cohort was taken to the section of the survey collecting their feedback about the assistant, and the second answered questions on the reasons why they did not use the assistant.

Exit interviews were conducted using Microsoft Teams, using its native recording and transcribing features. Interviews were unscripted and informal. Each interview lasted between 5 and 10 minutes. Chat logs were stored on a PostgreSQL database hosted within the institutional digital infrastructure. All student-generated data was securely stored within the institutional data management system and available only to the research team.

Data Analysis Methodology

The collected survey data were analysed using descriptive analysis methods. Some causal relationships are outlined in the findings. The users were grouped by gender and age. We identified and characterised users by their previous self-reported behaviour with generative AI technology (heavy users, occasional users, non-users). Subgroups were compared to draw conclusions on the correlation between demographics, previous experiences with generative AI technology, and the results of the trial. The survey results were complemented with observations of user behaviour in the trial.

User chat logs were examined using a combination of thematic analysis to determine general trends in the usage of the AI chatbot. Descriptive statistics methods were utilised to compare the findings with relevant literature, and correlation testing was conducted to analyse if any observable correlations were statistically significant.

FINDINGS AND DISCUSSION

Entry Survey Results

A total of 37 learners responded to the pre-entry survey, out of 258 (14.3%).

AI Usage Patterns (Figure 1)

Findings reveal three distinct groups of users of AI tools: 19% heavy users, 46% moderate or occasional users, and 35% non-users with varying levels of awareness of AI tools. The distribution of users

suggests that the use of AI tools is in the growth stage, with a strong base of regular users and the potential to convert non-users into active users.

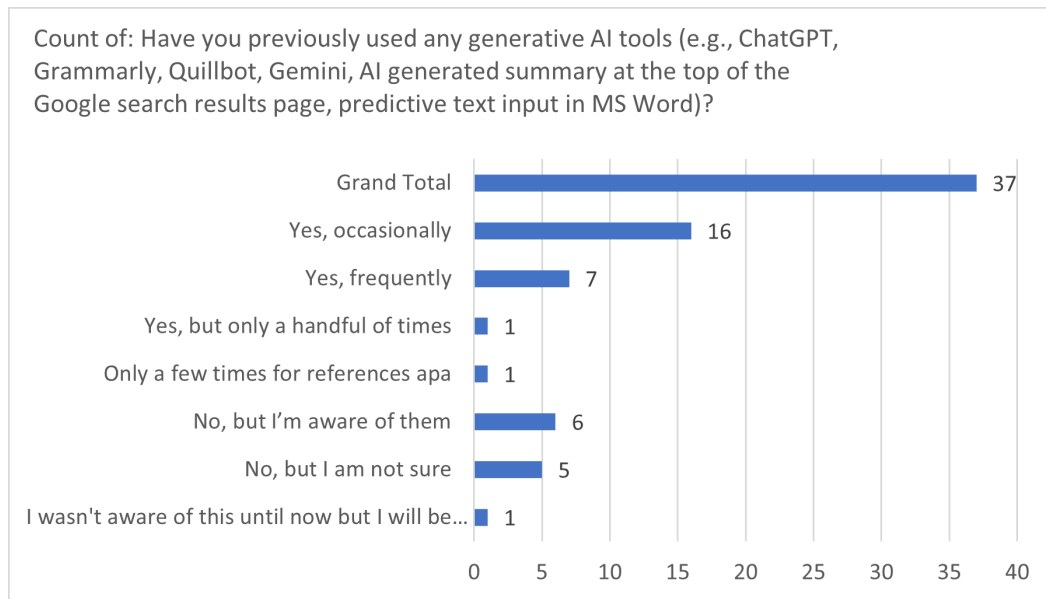


Figure 1. Previous experience with generative AI tools across the sample ©The Authors

Gender-wise Differences in Usage Patterns (Figure 2)

Gender-wise, the data revealed higher adoption of AI by male respondents, with nearly 91% of males having used AI tools vs 54% of females. Further, 27% of male respondents had used AI frequently, as against 15% females. The data also suggests that there is greater hesitancy amongst female users, with 38% of them having not used AI tools as against 9% of males. All males who responded were also definitive about their usage, as there were no "not sure" responses.

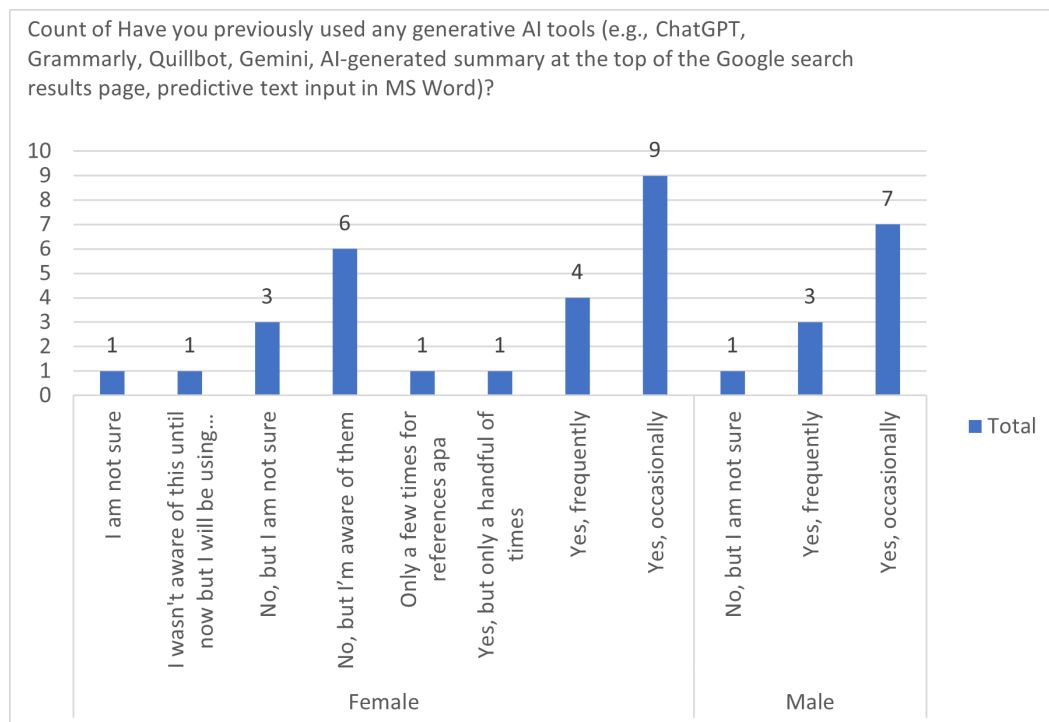


Figure 2. Previous experience with generative AI tools by gender ©The Authors

Age-wise Differences in Usage Patterns (Figure 3)

Other research informs that each generation has a unique relationship with technology (Chan & Lee, 2023; Mindbreeze, 2025). In our survey, the age group 25-34 showed the highest concentration of frequent and moderate/occasional users of AI tools. It is likely that this group is more comfortable with technology and is in jobs where AI tools provide value. The most diverse usage patterns were from the 35-49 age group. This group had the highest number of occasional users (38%), and they also showed significant non-adoption (31% were aware of AI tools but not using, or unsure of having used). This difference could be due to a cautious, evaluative approach to new technology. 16-19 and 20-24 groups showed high overall adoption but indicated occasional rather than frequent use. These findings suggest that, should the Polytechnic choose to offer Oppy as a learning tool, its adoption may be slow initially, with younger learners who are more comfortable with adopting new tools likely to adopt first. The other age groups should follow over time.

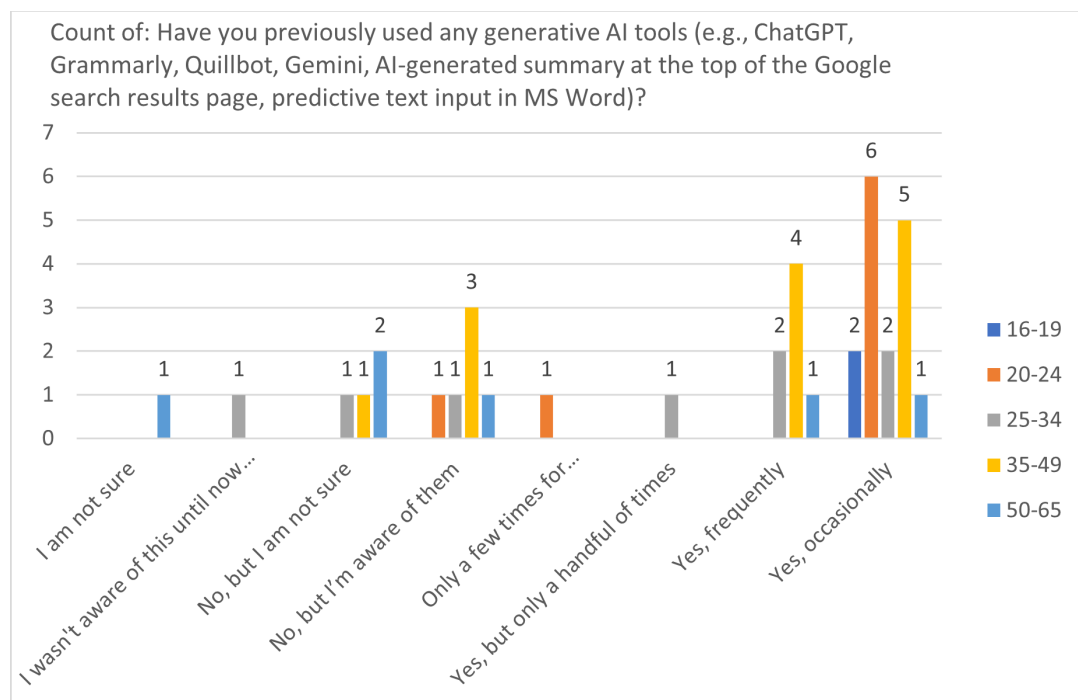


Figure 3. Previous use of generative AI tools by age ©The Authors

Familiarity with AI Chatbots (Figure 4, Figure 5)

The data reveals that most of the learners (97%) had heard of AI chatbots before the trial, and only one respondent was completely unaware. Further, a majority 65% had previously tried AI chatbots, ranging from occasional free use (51.3%) to significant paid use (13.5%) – suggesting limited deep adoption. Nearly 1/3rd of the respondents can be classified as “significantly aware” but an inactive group, who knew about AI chatbots but hadn’t intentionally engaged with them.

The gender differences for the familiarity measure were modest. This suggests that familiarity with AI chatbots is consistent across genders. There are only some variations in the intensity of adoption, but no fundamental differences in awareness or willingness to try.

However, there was a clear generational difference (figure below), with younger learners (16-24) showing 100% active usage and older learners 50-65 showing most aware but not using (50%). The 20-24 age group had the highest rate of paid subscription (37.5%). This suggests a strong age-technology

adoption curve, with younger learners being early adopters and older learners more cautious about engaging with AI.

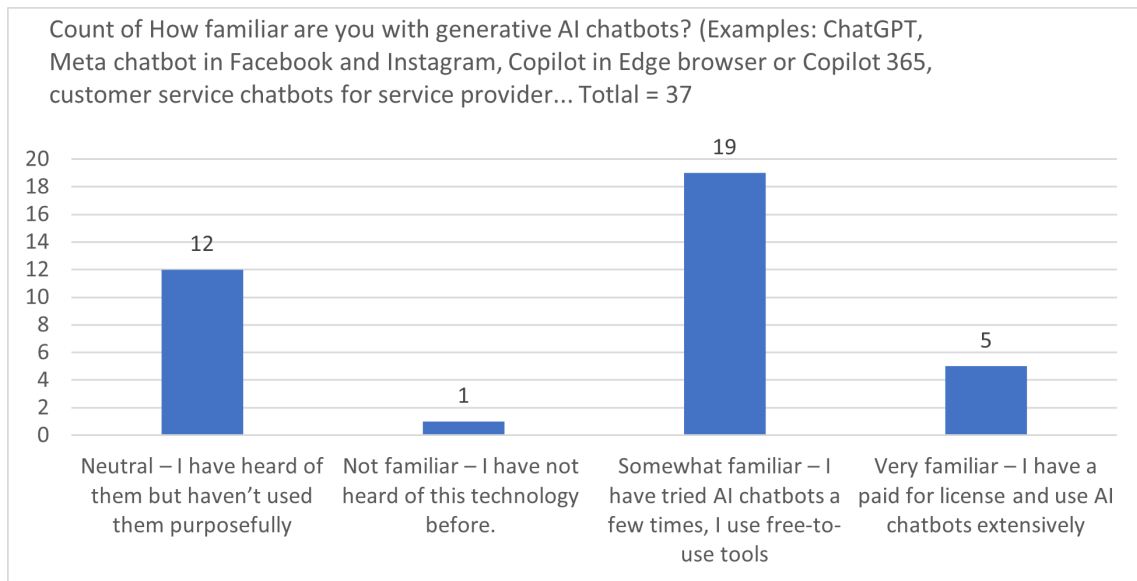


Figure 4. Familiarity with AI chatbots across the sample © The Authors

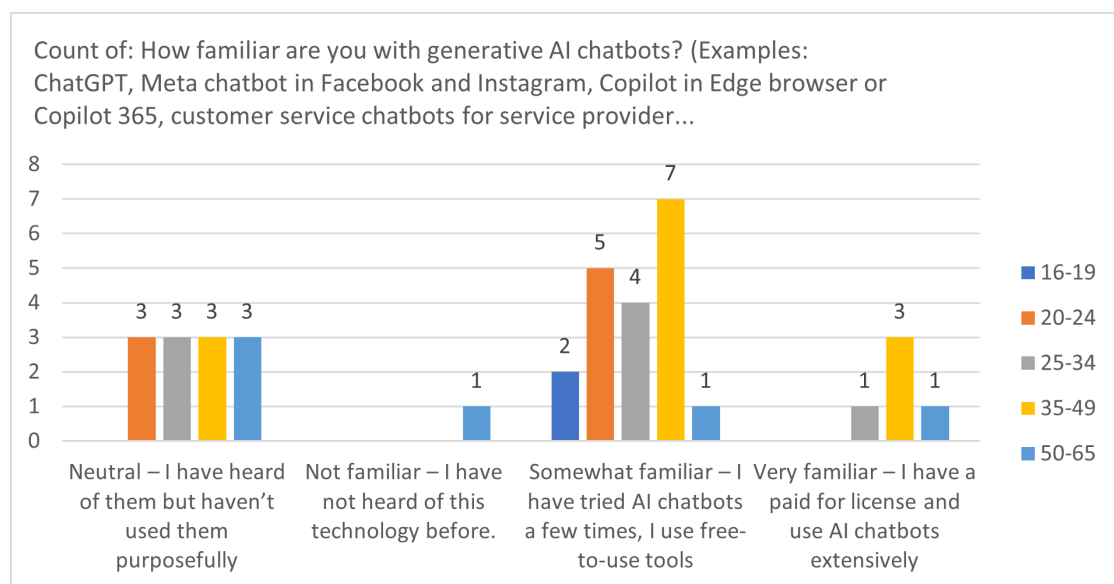


Figure 5. Familiarity with generative AI chatbots by age © The Authors

Technology Competency (Figure 6)

Our findings suggest that a large majority of respondents are comfortable using new technology, such as AI tools, implying technology friendliness. The “Somewhat comfortable” was the largest single group at 17 respondents (46%). There was no significant difference in the comfort level of those who wanted to trial the Oppy tool with those who didn't.

There was also no significant difference in the comfort level of European/European descent respondents (29) and those belonging to other cultural groups (Māori, Asian, and other – a total of 9 respondents).

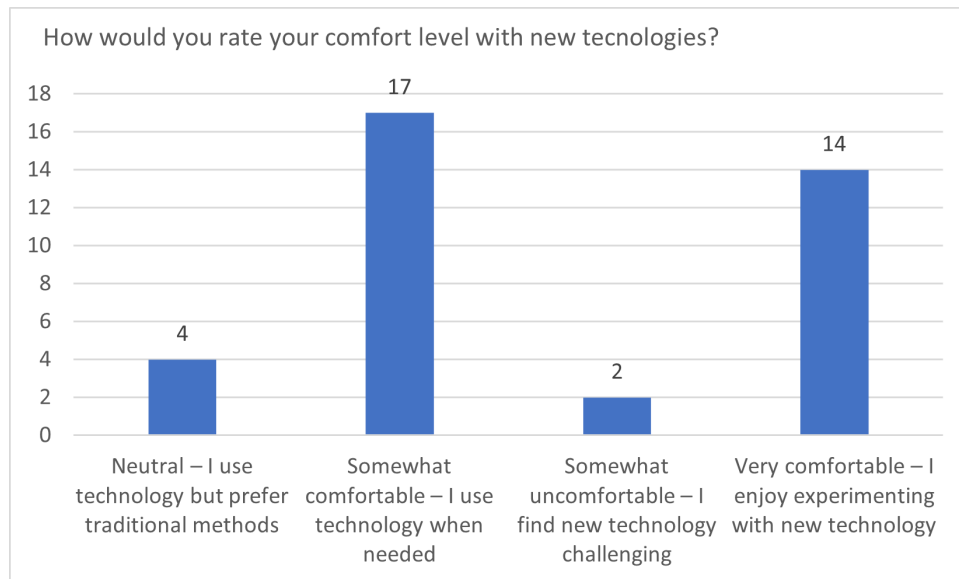


Figure 6. Comfort level with technology © The Authors

Learners' Perceptions about the Impact of AI on Their Learning (Figure 7)

The data revealed a strong optimism about AI's educational impact, with nearly 84% of respondents believing that the use of AI will improve their learning. The "Significantly improve my learning" was the largest group (at 43%).

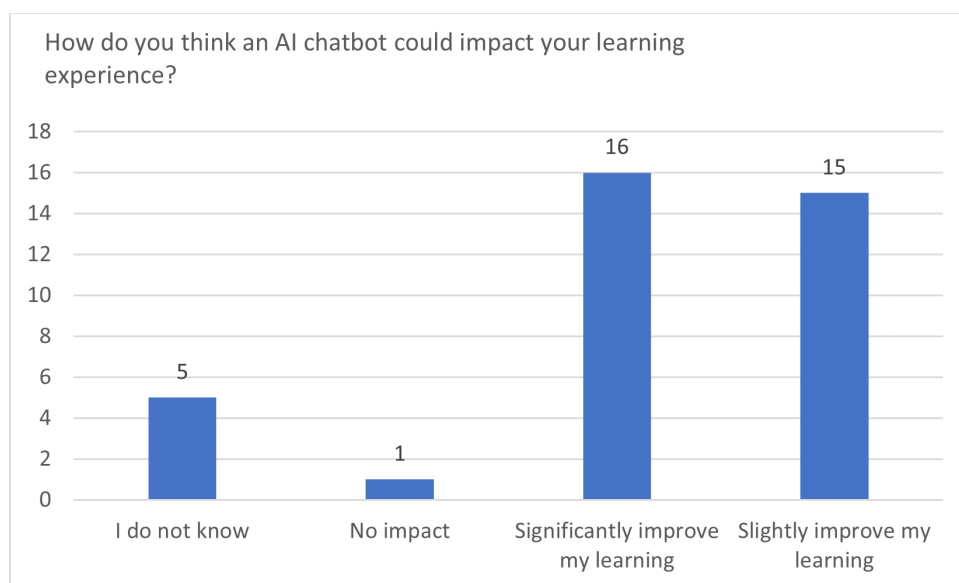


Figure 7. Perceived impact on learning © The Authors

Primary Concerns Surrounding the Use of AI Chatbots (Figure 8)

Most respondents chose 2-4 options as their primary concerns surrounding the use of AI chatbots. The data suggests that this is an informed learner base with a nuanced understanding of the risks involved in using AI chatbots. The primary concerns of a large majority (68-76%) are about the quality of information and ethics, rather than basic usability, suggesting their readiness for responsible AI use supported with appropriate guidelines.

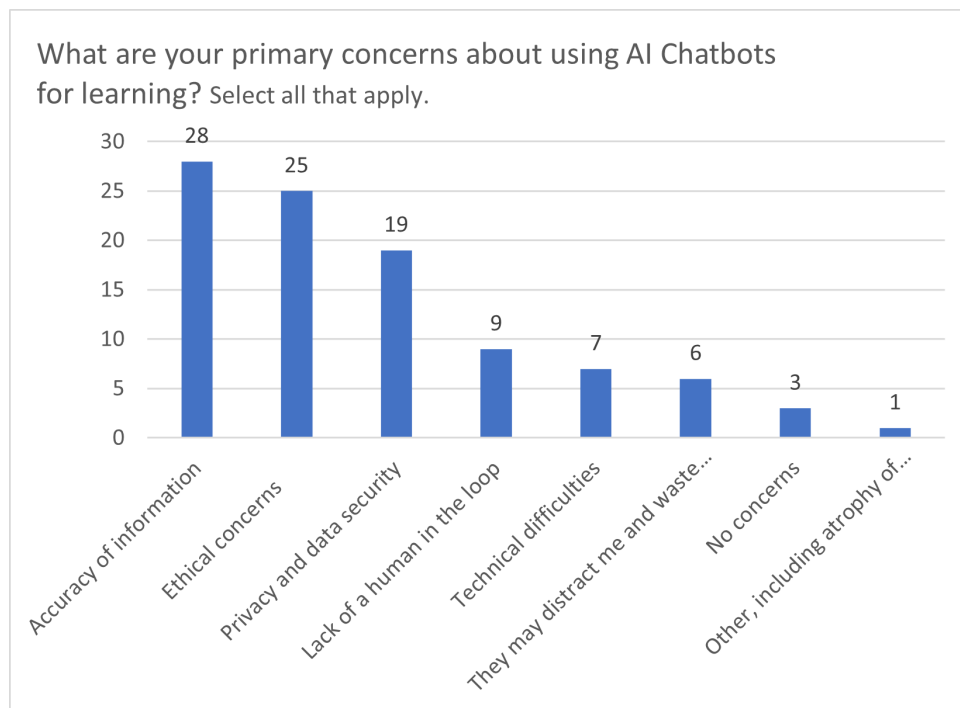


Figure 8. Primary concerns about using AI chatbots © The Authors

How do Learners Seek Help When Studying (Figure 9)

The Figure 9 data suggests that more than 50% respondents prefer established verifiable sources of information, including textbooks, course materials, and videos. Further, nearly 57% prefer to explore online, without the use of AI tools, favouring self-directed learning over receiving AI-generated responses. This, with or without the use of videos and searching information through books, would allow evaluating the credibility of the sources used by oneself rather than relying on AI's judgment. Overall, the data suggests that learner appear to be making informed choices to prioritise their learning techniques that align with values, such as accuracy, authenticity, and reliability.

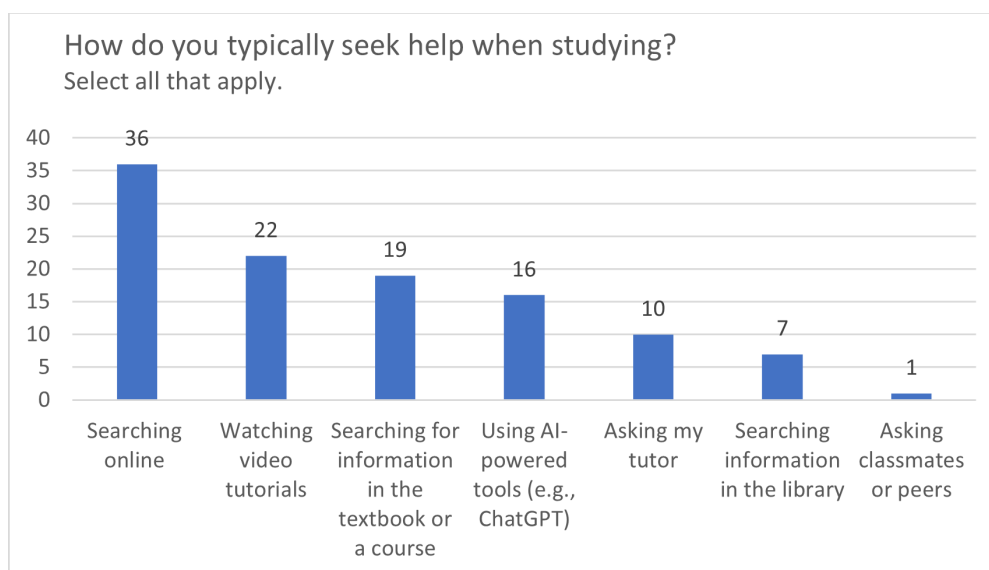


Figure 9. Seeking help with studies © The Authors

Expectations from an AI chatbot (Figure 10)

The Figure 10 data suggests that there is a learning, constructivist focus amongst most respondents (70-97%), where they see AI tools as an educational assistant and as a thinking partner (brainstorming, feedback) rather than as a tool, which would complete their tasks. This indicates educationally sound expectations of AI tools when engaged with. A stronger focus on understanding and explanation on one side and lower interest in direct help (28%) on the other shows appreciation for the supportive functions of AI, together with an understanding of integrity concerns surrounding unethical use.

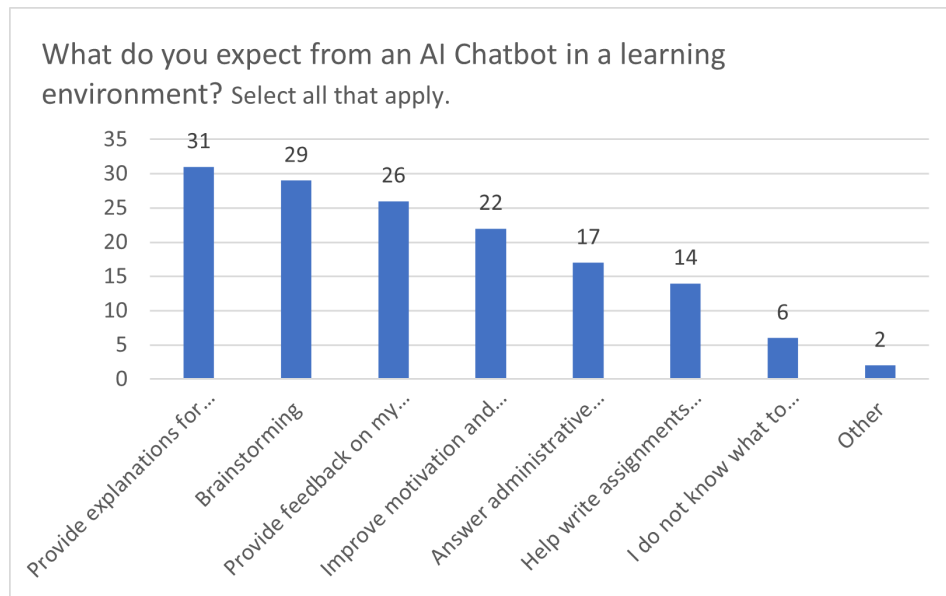


Figure 10. Expectations from an AI chatbot

Limitations of the Entry Survey

The sample was heavily skewed towards female participants (70% female versus 30% male), which reflects the demographics of the Open Polytechnic learner population: 69% of OP students are females (Open Polytechnic, n.d.-a). Only learners from the European/European descent (28), Māori (6), Asian (2), and other (1), cultural groups chose to participate in the entry survey (pre-adopting the Oppy tool). No Pasifika learners participated. This doesn't adequately represent the sampling frame or the sampling population. Given these limitations and a small sample size, it is difficult to generalise the findings of this survey to the total population.

Exit Survey Findings

Reliable conclusions cannot be drawn from the exit survey, as only 4/10 learners who installed and used the AI assistant responded to this survey. One respondent who had installed but did not use it also participated in the exit survey. However, at least three of the above four, 75%, responded that:

- the chatbot was easy to install
- they used the tool a few times per week
- *their expectations from the tool were low*
- one of their reasons for using the chatbot was to get help with the assessments
- *that the chatbot slightly eased their learning*
- *there was no change in the frequency of engaging with the course material due to the chatbot*

- *they did not notice any reduction in the need for interacting with the instructor or the student mentor during the trial (4/4 =100%)*
- *by the end of the trial, they had stopped verifying the accuracy of the chatbot’s answers*
- *the chatbot slightly helped them become more efficient in their studies*
- *the chatbot made no noticeable impact on their academic performance (4/4 =100%)*
- *they’d like to continue using an AI chatbot as part of their learning experience in the future (4/4 =100%)*

Responses for the other questions were more distributed, but it is still worth noting that 2/4 (50%) of the exit survey respondents rated their overall experience with the chatbot as neutral, and the other 2/4 (50%) as somewhat positive. This correlates with the finding that all those who installed and used the AI assistant would like to continue using it.

The *italicised findings* above also align with other research which substantiates that experiences are shaped by expectations. For example, Villiger (2021) argues that despite their unreliability, expectations about transformative experiences or outcomes influence the experience of the outcome. In the context of offering an AI assistant as a learning tool and managing users’ experience this implies the importance of: providing chatbot use instructions; setting expectation and use boundaries; monitoring points where ethical use expectations of the provider, and learner’s fair expectations are not being met and improving those; enabling seamless escalation by providing “talk to a human” option; personalisation; creating chatbot variations and using A/B testing for performance optimisation. Such strategies should help shape future expectations, satisfaction, and behaviours.

PARTICIPANTS’ ENGAGEMENT BEHAVIOUR WITH THE CHATBOT

The trial demonstrated a low interest in trialling AI chatbot technology across the body of students. Out of 258 invited participants, only 37 completed the entry survey, and 30 consented to participate in the trial and allowing the researchers to assess the chat logs. Out of 30 participants consenting to trial the Chatbot, only 10 engaged in a conversation with the Chatbot. In total, these learners generated 1,508 words, whereas the AI assistant generated 32,207 words.

Chat logs analysis

Sample size and the size of the collected corpora are not illustrative enough for a conclusive semantic analysis. However, several patterns emerge across the sample:

Users’ Prompts Word Count

Table 1. Average word count per user prompt and AI response, per user

User	Average of word count (user)	Average of word count (assistant)
User 1	12.94	57
User 2	27.67	264.29
User 3	7.32	147.33
User 4	6.23	145.5
User 5	7.00	127

User 6	18.53	348
User 7	10.00	190.64
User 8	4.25	106
User 9	3.00	408.66
User 10	6.50	196.2

Analysis of logs suggests that the three most common patterns of use were:

- Requests for answering assessment questions
- Providing definitions
- Searching the course content.

No user used the chatbot for brainstorming. No administrative questions were asked, with one exception. Only one student used the chatbot to seek writing feedback.

Some users utilised the AI assistant as a search engine or as a glossary of terms. The prompts were naïve, did not give directions to the AI assistant, and did not provide the desired format for the output. As a result, the response is not tailored in voice or formatting, nor does it provide a wider variety of exemplars. As pointed out in Sandler et al. (2024), ChatGPT defaults to around 300 words per response, which is supported by the average across all AI assistant responses at 235.33. However, on average, humans tend to generate much longer prompts when engaging in natural dialog (around 60 compared to 10.07 in the trial), supporting the hypothesis that the trial participants did not engage in natural language dialog with the assistant.

The chat logs reveal that the purpose of the users' engagement occasionally misaligns with the generative AI technology's capabilities. In most cases, the users are looking for a search engine or a glossary of terms to support their learning, not for a text generator. This observation is supported by qualitative data. In exit interviews, one participant mentioned that their only purpose of using the assistant was for it to locate specific content within the course and provide the user with an active link to the relevant material. The user struggled to identify any other use for the assistant.

The technology-to-performance chain model proposed by Goodhue & Thompson (1995) assesses the relationship between technology characteristics and efficacy of use. Task-technology fit construct suggests that a user's performance may be impacted when technology characteristics are not fit for the tasks supported. Using the above model, McGill and Klobas (2008) probe into e-learning technology and its impact on student success. Their study confirms that task-technology fit has a strong impact on perceptions of learning. This suggests that the intention of how to use AI assistants may significantly impact the perception of the success of the interaction. Xu et al. (2023) note that users are less inclined to fact-check ChatGPT's output due to perceived information quality being higher (presented in narrative as opposed to a collection of links). When performing fact-checking tasks, the users in ChatGPT group reported higher satisfaction even though their performance indices were lower than those of the group that used Google search.

Assistant's Response Word Count

AI assistant generated responses did not correlate with the length of the users' prompt or the courseware that the assistant referenced:

Example 1:

User: Define the X aspect

Courseware: [4-word definition]

AI assistant: [246-word response]

In this example, the assistant provided first a definition of the term and then gave examples of how the term might be interpreted in practice; however, none of the responses were contextualised within the subject matter of the course. Neither did it reference the definition given in the courseware itself.

The AI assistant formed more helpful responses when there was a context to the conversation.

Example 2:

User: What is a X

Courseware: [403-word chapter]

AI assistant: [317-word response]

In this instance, the assistant's response was more succinct than the courseware and focused mainly on the definition being searched. Furthermore, the response was contextualised within the previous conversation and was imbued with the details from a scenario the user shared (based on the assessment scenario).

Despite the assistant being used for unintended purposes here, this use case indicates that given sufficient content, the assistant can formulate responses that reduce the user's cognitive load and provide accurate and course-relevant information.

It should be mentioned that both responses fall within the expected word count for ChatGPT. As mentioned above, this finding is consistent with the existing literature. As one example, Sandler et al (2024) mentioned that "word count for ChatGPT dialogues ... was significantly ... longer in comparison to the human dialogues" (p.4). In their study, "the use of ChatGPT's default word limits resulted in conversations averaging 300 words — far exceeding the 60-word average in human dialogues" (Sandler et al, 2024, p. 13). In the ODFL setting, this would inevitably mean that the use of generative AI assistants based on ChatGPT models would lead to high word count responses, increasing the cognitive load on the learner.

Based on the initial screening of the chat logs, we formed a hypothesis that the chat's word count by the assistant may correlate with the prompt word count. We analysed 133 interactions between a user and the assistant in word count. With Pearson's coefficient of 0.2923 (weak positive correlation) and Spearman's ρ of 0.0925 (not statistically significant), there is not enough evidence to support this hypothesis.

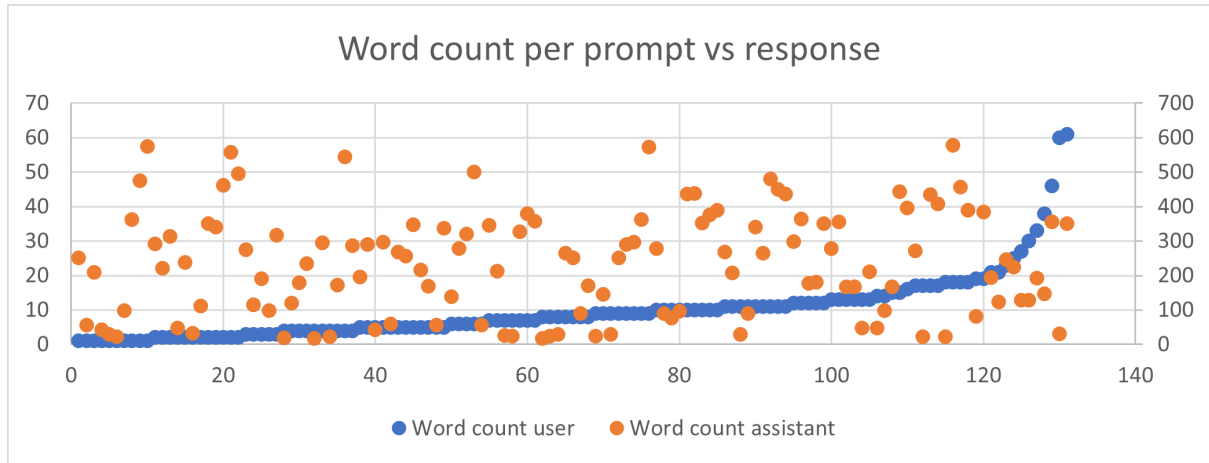


Figure 11. Word count per prompt versus word count per response © The Authors

In Figure 11, the y-axis on the left represents the word count of the users' prompts. The right secondary y-axis represents the word count of the AI-generated responses. The users' prompts are sorted by word count in ascending order.

Thematic Analysis

Summary of the thematic analysis is presented in Table 2.

Table 2. Thematic analysis per user

User	Interactions	Themes
User 1	70	Summative assessment
User 2	24	Rephrasing/rewriting for clarity Learning support
User 3	44	Search Course content
User 4	60	Quasi-social conversation Admin and technical details Learning support
User 5	4	Formatting Summative assessment
User 6	30	Formative Assessment model answers Glossary
User 7	6	Referencing Glossary
User 8	6	Search
User 9	14	Glossary
User 10	4	Summary of the page

The above users adhered to the use purposes they stated on the survey. Only one user selected all the given options in the question on the purposes for which they would use the bot; however, the logs demonstrate that they exclusively used the assistant to help with their summative assessment.

Themes of interactions summarised in Table 2 can be interpreted as indicating that the AI assistant trial users were more often seeking general knowledge and support from the assistant, and model answers for the assessment, rather than assistance with content consumption. This indicates that either:

- The engagement with the course content is low, and the learners are focusing more on the practice exercises and summative assessment in the course; Or
- The learners struggled to identify appropriate interaction points for using the AI assistant.

The latter point is supported by the exit survey findings, which reinforces this well-established e-learning issue with technological adoption. Mishra and Koehler (2006) scrutinise the rupture between content, pedagogy, and technological knowledge, proposing the TPCK (Technological Pedagogical Content Knowledge) framework that brings the three together. The main argument, although almost two decades old, revolves around the familiar issues of high rate of technology change, and overfocus on the “what” over the “how”. As the authors argue, “[part] of the problem ... has been a tendency to only look at the technology and not how it is used. Merely introducing technology to the educational process is not enough” (p. 1018). The solution is coherence within the curriculum design systems. Therefore, before introducing AI assistance in courses, an attempt should be made to integrate AI assistants with the elements of pedagogy and content systematically and intentionally. Learning-technology-by-design approach (Mishra & Koehler, 2006) suggests that learning by doing in an authentic context affords the opportunity “to transcend the passive learner role” (p. 1035). In practical terms, this implies that the course learning designer should identify AI assistant intervention points and suggest exemplar prompts that the learners could later modify to suit their learning style or specific scenarios to engage the learner with the activity.

REALISED RISKS

The information sheet provided to the prospective participants of the trial highlighted that the users are encouraged to utilise the AI assistant for learning the content of the courses within the scope of the study, and with due consideration to academic integrity. However, in the trial, 50% of the users (n = 5) applied the AI assistant to a wider range of courses than to those identified. Furthermore, one user (10%) used the assistant to generate elements of indigenous Māori knowledge, which directly contravened the trial instructions. One learner (10%) used the AI assistant exclusively to generate answers for a summative assessment’s tasks, which was also not permitted.

This demonstrates that ethical concerns envisaged before the trial were appropriate and valid. More attention is required to ensure that all necessary guardrails are in place before the rollout of any generative AI technology for all the learners of the institute. As an example, content category blocks may be introduced for any tikanga Māori elements.

CONCLUSION, IMPLICATIONS, AND SUGGESTIONS

The study analyses the results of a trial of an AI assistant at the Open Polytechnic of New Zealand conducted during May-July 2025 with learners of three online Business Management courses. Using descriptive, thematic, and qualitative analysis of the entry, exit surveys, and chat logs, we conclude that to use generative artificial intelligence in ODFL environments, the instructional design must support the stack of technologies intended for use by the learners.

Uptake

The trial demonstrates that there is a funnel for learners' engagement with the AI assistant offered as a part of the trial. Only 14.3% of learners invited to participate in the trial completed the entry survey. This result can be partially explained by the learners' reluctance to have their chat logs screened by the research team. However, of the participants who consented to the trial and chat logs screening, only 33.3% used the provided assistant. Of the participants using the assistant, half engaged in under 10 interactions in total. Of the participants who installed the assistant and did not use it at all or limited their use to search, their self-reported reason was that they did not feel compelled to use the AI assistant for any purpose. Granted, the courseware was not designed to be consumed alongside an AI assistant, which suggests that, unprompted, the users struggle to identify opportunities for AI use in education. Providing the learners with opportunities to use more advanced models than they would have access to does not guarantee that many students will engage in learning improvement activities using this technology. It is suggested that the courseware is developed with a full stack of technology for the targeted users, and engagement points are pre-built into the narrative flow.

Prompting

As Table 1 and Figure 11 suggest, users of the AI assistant generated short and naïve prompts that lacked clear direction for the chatbot and resembled a search engine inquiry. This demonstrates that not only are the users struggling to identify opportunities for using the chatbot, or lack motivation to explore its capabilities, but they also require training in prompting the assistant for optimal use. When presented with technology but no training, they default to familiar modes of engagement, effectively using the GenAI tools as search engines or an online glossary. Either providing training on the use of technology or giving exemplars for the prompts should address this skills gap and ensure repeatability and consistency of outcomes across the student body.

Intentionality

The chat logs demonstrate that the users used the AI assistant as a search engine and glossary of terms. This resulted in a lower quality of prompts and, consequently, generic outputs by the AI assistant. Organisationally, this may lead to adopting a stack of technologies overlapping in functionality, and thus higher overheads for licensing and maintenance. For the user, this may result in cognitive overload and a preference to use one application for intended and unintended purposes rather than use a combination of the most appropriate tools to suit each task.

Word Count

The ChatGPT model at the backend of the AI assistant generates responses averaging around 250 words. This far exceeds the user's prompts word count (10 words on average) and does not correlate with it in length. The context of the courseware does not significantly influence the length of the AI

assistant's response. However, the context of the conversation and better prompting can potentially lead to improved results. This further emphasises that the AI assistant use should be factored into the learning design of the courseware, and appropriate methods of use are embedded within the content.

AUTHORS' CONTRIBUTIONS

- Conceptualization – Anna Gubinskaya, Renu Joshi
- Formal analysis – Renu Joshi (Entry, exit survey results), Anna Gubinskaya (Chat logs)
- Funding acquisition – Anna Gubinskaya
- Investigation – Anna Gubinskaya, Renu Joshi
- Methodology – Anna Gubinskaya, Renu Joshi
- Project administration – Anna Gubinskaya, Renu Joshi
- Resources – Anna Gubinskaya, Renu Joshi
- Visualization – Renu Joshi
- Writing – original draft – Anna Gubinskaya, Renu Joshi
- Writing – review & editing – Anna Gubinskaya, Renu Joshi

All authors have read and agreed to the published version of the manuscript.

Data Accessibility Statement

The data that support the findings of this study are available from the Open Polytechnic of New Zealand but restrictions apply to the availability of these data. The full data contains personal and confidential information, and so are not publicly available. The sanitised datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Ethics and Consent

The research was conducted with the learners of the Open Polytechnic. The project was approved by the Ethics Committee (approval number EC-202503-05). Participants of the trial consented to data generated by them being used for this publication.

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AI and the Evolution of Research and Learning Design: A Digital Ethnography of Emergent Practices and Perspectives

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ABSTRACT

This paper examines how artificial intelligence (AI) is reshaping scholarly practice in research and learning design. Drawing on a digital ethnography of a facilitated community of practice—including interviews, written reflections, and collaborative exchanges—we analyze how educators and researchers are experimenting with AI in ways that accelerate workflows while challenging inherited norms of rigor, authorship, and credibility. Findings reveal three key patterns: the emergence of shadow infrastructures where much AI experimentation circulates; the reconfiguration of authorship as assemblage through prompting, iteration, and remix; and the development of reflexive practices such as usage statements, prompt logs, and scenario prototyping that foreground transparency and care. We frame these practices as in-flight inquiry: knowledge creation that is partial, provisional, and still valuable. The paper concludes with a call for people-ready scholarship: reflexive, relational, and equity-centered approaches that honor process as a site of rigor. Recognizing these practices as valid contributions will be essential to ensuring that AI strengthens, rather than undermines, scholarly culture.

Keywords

AI in education; research culture; learning design; scholarly identity; reflexive practice; digital ethnography; academic innovation; remix culture; authorship; trust

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INTRODUCTION

The rapid uptake of AI in education has revealed a deep misalignment between practice and recognition. Faculty, designers, and researchers are experimenting daily with generative AI as they use

it to accelerate literature reviews, revisit dormant projects, prototype assessments, and scaffold reflection. These developments are not marginal. They signal a broader transformation in how scholarly knowledge is produced, shared, and validated. Yet this transformation is unfolding within institutions that are far slower to evolve. Tenure and promotion cycles, journal publishing timelines, and formal design approval processes remain bound to conventions of authorship and rigor that assume stability, polish, and finality. The result is a widening gap between what scholars and designers are actually doing with AI and what academic systems are prepared to recognize as legitimate knowledge. This misalignment is not only structural but cultural, shaping how educators negotiate credibility, disclosure, and scholarly identity in an AI-saturated environment.

This paper argues that to keep pace with AI-driven change, educators and researchers must adopt open, iterative, and participatory approaches to inquiry. Doing so requires reframing scholarship not only as the production of finished artifacts but also as the documentation of work in motion. We describe this orientation as in-flight inquiry: knowledge creation that is partial, provisional, and public, yet still valuable. In-flight inquiry names a form of rigor that is grounded not in closure, but in transparency and reflexivity. To examine this cultural shift, we draw on a digital ethnography of a facilitated community of practice (Wenger, 1999; Wenger, 2011), organized around AI use in research and learning design. Participants included faculty, instructional designers, and researchers who contributed reflective blog posts, took part in structured interviews, and engaged in ongoing conversations about how AI was reshaping their work. These contributions were thematically coded and analyzed through portraiture, a methodology that highlights lived experience and situated practice. The goal was not to generalize or predict adoption trends, but to surface the textures of practice as they are negotiated in real time.

What emerges from this analysis is not a simple story of wholesale adoption or resistance, but one of negotiation. Across accounts, scholars treated AI as a partner to think with: useful for generating drafts, scaffolding ideas, or providing alternative perspectives, yet always subject to human verification and judgment. This balancing act reflects both excitement and hesitation, as participants embraced AI's potential while worrying about questions of authorship, credibility, and ethical responsibility.

The analysis surfaced three recurring patterns. First, AI is being used to reimagine scholarly and instructional workflows, from revisiting abandoned projects to prototyping new forms of assessment. Second, fears around credibility and ethical use inhibit open sharing, which has led to the growth of shadow infrastructures such as blogs, prompt logs, and peer exchanges where much of the real work circulates. Third, educators are beginning to model a remixable form of scholarship, where authorship is treated as assemblage, transparency is valued as rigor, and identity is shaped through reflexive documentation of process. These patterns suggest both risk and possibility. The risk is that the scholarly practices with the greatest potential to humanize AI—collaborative reflection, open documentation, and critical remix—will remain undervalued and invisible. The possibility is that these same practices can be recognized as valid scholarly contributions and scaffolded into broader cultural change.

We organize the paper around four movements. First, we examine the legacy systems that constrain scholarly practice, and the liminal, often invisible workarounds educators are building. Second, we explore how these practices are giving rise to a different sense of authorship—remixable, relational, and reflexive. Third, we turn to thick description, drawing field notes from educators' real experiments with AI in both research and design. Finally, we consider the cultural and institutional opportunities at

stake if these emergent practices are recognized not as marginal, but as foundational to scholarship in the age of AI. Taken together, these sections advance the claim that AI is catalyzing a shift toward remixable, relational, and reflexive scholarship. Rather than treating shadow practices as temporary stopgaps, we argue they represent the future of academic work: a people-ready scholarship that honours emergence, not just arrival.

LEGACY SYSTEMS AND LIMINAL PRACTICES: WHERE INNOVATION GETS STUCK

The rapid adoption of AI in education has collided with the slow-moving machinery of academic life. Faculty, instructional designers, and researchers are integrating AI into their daily practice in ways that range from revisiting stalled writing projects to prototyping new forms of assessment. Yet the structures that govern scholarly recognition, including publishing timelines, authorship conventions, accreditation processes, and design approval systems, remain rooted in assumptions of stability and finality. The result is a widening gap: the pace of practice accelerates while the systems of validation lag behind.

This gap is experienced by practitioners as a form of liminality. On the one hand, they are encouraged to innovate with AI in classrooms and research projects. On the other hand, they are discouraged from openly disclosing those same practices in peer-reviewed publications, grant applications, or institutional reporting. In this in-between state, educators find themselves navigating contradictory signals: celebrated for creativity in informal contexts but constrained by the conservatism of formal ones.

What emerges in this space is what we describe as a shadow infrastructure. It consists of blogs, Slack channels, collaborative documents, prompt libraries, and peer-to-peer exchanges where the real experimentation with AI takes place. These spaces are not marginal add-ons. They are formative sites where norms, ethics, and methods are actively being negotiated. The shadow infrastructure functions as the provisional architecture of an emerging scholarly culture, one that is already shaping how AI is integrated into inquiry and design even if it remains invisible to institutional gatekeepers. This invisibility echoes what scholars have long identified as invisible labour in academia: intellectual and creative contributions that are essential to the functioning of scholarly life but remain undervalued because they do not fit inherited categories of rigor or productivity (Mountz et al., 2015). In the context of AI, this labour includes documenting prompts, refining outputs, and engaging peers in critical dialogue. It is work that is time-intensive, intellectually rich, and socially consequential, yet rarely acknowledged in traditional metrics of academic success.

The affective dimensions of this liminality are just as significant as the structural ones. Educators describe a careful balancing act: trusting AI enough to let it serve as a collaborator while constantly verifying its outputs; sharing their experiments with colleagues while worrying that disclosure might undermine their credibility. This is not uncritical adoption. It is a practice of cautious experimentation, taking place in the absence of clear norms, policies, or protections. The tension produces both excitement and anxiety as practitioners negotiate how to integrate AI into their professional identities without jeopardizing their legitimacy. At stake is more than efficiency or convenience. What becomes visible in these shadow infrastructures is a new orientation to scholarly work that is iterative, reflexive, and participatory. Researchers use AI to capture their thinking in motion rather than to produce finished artifacts. Designers draw on AI to scaffold creative risks rather than to standardize outputs.

These practices embody what we describe as in-flight inquiry: a mode of scholarship that is partial, provisional, and still valuable.

This orientation aligns with a longer intellectual tradition that treats fragments not as shortcomings but as central to knowledge itself. Walter Benjamin's fragmentary style captured truth as emergent rather than complete, suggesting that unfinished texts can themselves be rigorous forms of scholarship (Benjamin, 1999). In this vein, the blogs, prompt logs, and partial drafts circulating in shadow infrastructures operate as fragments that preserve knowledge in motion, inviting interpretation and recombination rather than finality. What we describe as in-flight inquiry resonates with this approach: a mode of scholarship where openness and provisionality are constitutive of rigor.

Recognizing in-flight inquiry requires cultural and institutional change. Blogs, prompt logs, usage statements, and collaborative exchanges should not be dismissed as ephemeral byproducts but treated as artifacts of rigor in an AI-mediated research and teaching culture. Unless institutions legitimize these practices, they will continue to unfold in the shadows: informal, precarious, and unrecognized, even as they quietly shape the future of scholarship.

REMIXABLE SCHOLARSHIP AND THE REBIRTH OF THE SCHOLARLY SELF

The practices surfaced in the ethnography do not simply illustrate liminality; they demonstrate how scholars and designers are already redefining authorship. Across reflections and discussions, contributors described AI not as a replacement for human creativity but as a partner in prompting, iterating, and remixing ideas. Authorship emerges less as a solitary performance and more as an assemblage of human judgment, machine suggestion, and peer reflection. Participants frequently reached for metaphor to capture this shift. Some described AI as a "second-language interpreter," emphasizing how it expands access to disciplinary discourse by translating ideas into more formal scholarly registers. Others characterized it as "scaffolding for imagination," a structure that made experimentation less risky and enabled more speculative thinking. Still others spoke of it as a "cognitive mirror," reflecting back half-formed ideas in ways that surfaced assumptions and opened new possibilities. These metaphors illustrate how authorship is becoming a distributed practice, co-constructed through human and machine collaboration.

This orientation resonates with conceptual foundations already present in scholarly discourse. Gunder's articulation of the open turn highlights how rigor can be demonstrated not through closure or polish but through openness and participation (Gunder, 2021). Remix theory, as described by Navas, frames authorship as recombination and reinterpretation rather than as solitary originality (Navas, 2012), which illuminates how AI-enabled workflows extend creative agency by weaving together fragments of human and machine expression. In a similar vein, Walter Benjamin's fragmentary style suggested that knowledge emerges not through linear completion but through constellations of thought held in tension (Benjamin, 1999). In-flight inquiry echoes this sensibility: it values the provisional and the fragmentary as central to knowledge-making rather than peripheral.

The permeation of generative AI also resurfaces long-standing debates about authorship. Foucault's notion of the "author function" challenged the idea of the author as a natural category, framing it instead as a cultural construct tied to systems of classification and authority (Foucault, 1977). Barthes's declaration of the "death of the author" rejected originality as the foundation of meaning, emphasizing

the primacy of readers and texts over authorial intent (Barthes, 1977). bell hooks adds a critical dimension by situating authorship within struggles over power and voice. For hooks, authorship is never neutral but is shaped by histories of exclusion and the ongoing need for marginalized voices to claim space and authority in scholarly and cultural production (hooks, 1994). AI makes these dynamics newly visible by distributing authorship across humans, machines, and communities of practice. The generative text is not the product of a single voice but of a relational process involving prompts, algorithms, and social negotiation. What Foucault and Barthes theorized, and what hooks insisted must be reckoned with, AI now brings into everyday scholarly activity.

Sociocultural perspectives on writing reinforce this reconfiguration. Lunsford and Ede (1990) argued that authorship is inherently relational, produced in dialogue with others even when collaboration is obscured. The current moment differs in that this relationality is no longer hidden. Prompt logs, reflective notes, and shared drafts explicitly foreground the seams of collaboration, documenting how meaning emerges through iteration and exchange. Constructivist approaches to design further support this view by treating knowledge as co-constructed, scaffolded, and continuously revised through dialogue (Jonassen, 1999; Vygotsky, 1978).

Remixable scholarship also carries affective weight. Participants described hesitation and uncertainty, often linked to concerns about credibility, disclosure, or institutional sanction. At the same time, they spoke of moments of creativity, play, and relief. AI was experienced as both a safety net and a provocation: a tool that lowered barriers to participation while complicating assumptions about originality and rigor. These affective accounts destabilize the notion of authorship as control and instead reframe it as collaboration, negotiation, and care. In this sense, authorship in the age of AI is not diminished but expanded. It encompasses the design of workflows, the transparency of process, and the cultivation of reflexivity. It values the seams and scaffolds of scholarly work as much as the finished product. Taken together, these narratives suggest that the scholarly self is being reconfigured as remixable—porous, reflexive, and open to collaboration. What matters is not whether AI is used but how it is integrated into assemblages of human and nonhuman authorship. These conceptual shifts become tangible in the everyday practices of research and learning design, the focus of the next section.

FIELD NOTES FROM THE EDGE: AI-SUPPORTED PRACTICE IN ACTION

If the conceptual terrain of remixable scholarship points to a reconfigured scholarly self, the ethnographic data provide vivid accounts of how this transformation is unfolding in practice. Across interviews and written reflections, educators documented how AI was woven into the rhythms of research and design. Their stories illustrate a culture of experimentation: scholars testing the boundaries of credibility, designers reshaping pedagogical practices, and communities negotiating norms of disclosure and trust.

In research contexts, contributors described a wide range of experiments. Doug Belshaw, founding member of We Are Open, critiqued the cultural hype surrounding AI, warning that its adoption must be understood within cycles of media spin and motivated reasoning. Ian O’Byrne, Associate Professor of Literacy Education at the College of Charleston, emphasized situating AI within broader traditions of digital literacies, reminding colleagues that human-centered design principles remain essential for ensuring that generative tools do not displace critical judgment. Brian Arnold, faculty at National

University and a researcher of social and emotional learning, and John Martin, a senior teaching and learning developer at The University of Wisconsin-Madison, both described how AI helped them revisit stalled projects, using generated text not as finished products but as provocations to recover momentum and reframe scholarly questions. Similarly, Punya Mishra, Associate Dean of Scholarship and Innovation at Arizona State University, reflected on how AI produces “control-shift-return” moments—simultaneously accelerating work and surfacing tensions about authorship, agency, and academic integrity.

For other participants, AI became a partner in reflexivity. Some treated it as a simulated peer reviewer, soliciting critiques of draft manuscripts before submission. Others used it for early theme generation in qualitative data, producing tentative categories that research teams then debated and refined. Prompt logs, often kept for practical reasons, began to serve as reflexive journals, documenting epistemic decisions and methodological pivots that usually remain invisible. Across these examples, AI was less an endpoint than a cognitive mirror, reflecting assumptions and half-formed ideas in ways that prompted greater transparency and care.

Learning design practices revealed parallel forms of experimentation. Nathan Pritts, Professor of English at the University of Arizona Global Campus, described using AI to reimagine feedback processes, testing how models could simulate alternative instructor responses or anticipate student misunderstandings. Ryan Straight, Associate Professor of Information Science at the University of Arizona, engaged AI as a site of identity play, using generative outputs to explore disclosure, authorship, and positionality in his teaching. Several participants reported drafting AI usage statements for syllabi, not merely as compliance artifacts but as pedagogical tools that invited students into conversations about ethics and shared responsibility. And Adam Davi, Instructional Design Manager at The University of Arizona, spoke about the split roles that instructional designers are helming at the moment—developing high-impact practices for supporting faculty in understanding AI’s role in their course design and facilitation work, as well as reflexively examining the shift in the role of the instructional designer in the age of AI.

Assessment practices were especially generative. Multiple contributors described building scenario-based assignments with AI, producing branching narratives that offered students meaningful choices rather than fixed-response tasks. Others experimented with AI to prototype multiple-choice questions aligned to learning objectives, later revising them to address nuance and bias. Samantha Becker, an educational leader and storytelling expert, documented how AI was used to test potential student responses before implementation, enabling instructors to anticipate confusion and refine scaffolding.

Several educators emphasized that design experimentation was not peripheral but central to how they were rethinking teaching. Nathan Pritts, for example, highlighted how AI reshaped his approach to feedback, enabling more dialogic and personalized responses to student work. Ryan Straight used AI in the classroom as a form of identity play, engaging students in conversations about authorship and disclosure by modelling his own process. These accounts underscore that design practices were not simply applications of research habits but sites where transparency, collaboration, and reflexivity became pedagogical values. And Maren Deepwell, a leader in the field of learning technology and resilient leadership, discusses how technical usage of AI only tells one part of the story of how AI is changing education, elaborating on how literacies development is a critical part of our understanding of how AI is altering the pace of work and life.

In institutional leadership contexts, Tawnya Means, Chief Learning Officer at the University of Nebraska–Lincoln College of Business, and Melody Buckner, Associate Vice Provost of Digital Learning Initiatives at the University of Arizona, spoke candidly about contradictions: faculty were encouraged to innovate with AI in some settings while being discouraged from acknowledging that work in others. These tensions underscored the uneven and provisional character of emerging norms. And through the lens of computing education, Genevieve Smith-Nunes, Senior Lecturer and Research Fellow at the University of Roehampton, explored how the affordances and challenges of AI were changing more than our practices within learning and research, but also our fundamental approaches to educations across an individual's lifetime of learning.

Cross-pollination between research and design was evident throughout the corpus. Practices like prompt logging migrated from research journals into course design workflows. Usage statements drafted for scholarly writing appeared again in classroom syllabi as boundary-setting and pedagogical framing. Reflexive traditions from qualitative inquiry were recontextualized as design tools, helping instructors articulate not only what they taught but why. Interviews and written reflections blurred these boundaries altogether, circulating as both scholarly commentary and pedagogical model. Taken together, these examples illustrate a culture of co-inquiry. Scholars and designers did not present themselves as passive adopters of technology but as active negotiators, experimenting with AI while documenting its possibilities and limits. Their field notes capture a community learning in public: testing, revising, and sharing in ways that resist closure. What emerges is not a standardized set of best practices but a repertoire of situated experiments that collectively signal how scholarship is being reimagined in the age of AI.

WRITING THE RULES IN REAL TIME: CULTURAL SHIFTS AND INSTITUTIONAL OPPORTUNITIES

Rethinking Rigor

The practices described in interviews and written reflections are not simply pragmatic responses to new tools. They signal deeper cultural shifts in how knowledge is created, circulated, and recognized. What emerges is not only a set of technical experiments but a reorientation of scholarly norms toward transparency, reflexivity, and collective authorship. Traditional models equate rigor with polish and closure, privileging the finished manuscript, the finalized syllabus, or the published assessment. Yet the practices emerging across research and design show that rigor can also reside in transparency, process, and relational care. Prompt logs, usage statements, and iterative drafts are not auxiliary to scholarship; they are its scaffolds, documenting epistemic decisions, values, and uncertainties as knowledge is made.

This expanded view of rigor also reopens longstanding debates about authorship. Rather than a solitary voice producing finished products, scholarship increasingly takes the form of assemblages: human and machine contributions iterated, remixed, and contextualized within communities of practice. When such relational artifacts are recognized as valid contributions, rigor becomes less about solitary originality and more about the cultivation of reflexivity and trust.

Building Infrastructures for In-Flight Inquiry

Another implication is the need to develop infrastructures that support what we describe as in-flight inquiry—scholarship that is provisional, partial, and still valuable. Faculty, designers, and researchers

are already documenting their process through reflective logs, scenario drafts, or annotated prompt histories. Yet without institutional recognition, these artifacts remain undervalued.

One way forward is the creation of reflective publishing formats that value mid-process contributions. Just as preprint servers have accelerated scientific exchange, platforms for reflective or provisional publication could legitimize prompt logs, usage statements, or annotated iterations as scholarly outputs. Communities of practice also function as infrastructure by allowing educators to narrate experiments collectively, compare approaches, and refine emerging norms. Institutions could complement these efforts with templates and mentorship that reduce risks of disclosure. For instance, faculty could be supported in drafting AI usage statements for both syllabi and research outputs, lowering the threshold for transparency and making disclosure a shared norm rather than an individual gamble.

Learning Designers as Translators and Facilitators

Learning designers and educational developers have a distinctive role in this cultural shift. Positioned between faculty, students, and institutions, they act as translators across research, teaching, and policy domains. Reflections from the field show how designers are already scaffolding ethical AI use: drafting usage statements, prototyping assessments with scenario narratives, and creating space for reflection on process. By documenting these practices and framing them as scholarly contributions, designers can model new forms of rigor that center reflexivity. They can also convene cross-role conversations, bringing faculty, librarians, and administrators into dialogue about what counts as credible and ethical AI practice. Designers, in this sense, are not only service providers but cultural facilitators—helping institutions move from fragmented, contradictory guidance to shared norms of practice.

Postdigital Pedagogy and the Normalization of AI

These shifts align with what Martin Fawns (2022) describes as postdigital pedagogy, where digital technologies are not treated as add-ons but as integral to the lived fabric of education. In a postdigital frame, the question is not whether AI belongs in research or teaching, but how its integration can be guided by values of care, equity, and reflexivity. The reflections highlight this orientation. When participants co-created AI usage statements with students, they positioned disclosure as a pedagogical move, not just an ethical one. When faculty used prompt logs as reflexive journals, they reframed technical traces as epistemic artifacts. When leaders acknowledged contradictions in institutional guidance, they modelled vulnerability and invited cultural change. These practices embody a postdigital approach: not fetishizing the tool, but embedding it in pedagogical and scholarly traditions.

Cross-Functional Collaboration

A further implication is the importance of cross-functional collaboration. Librarians, writing center staff, instructional designers, and faculty developers are already helping faculty and students navigate AI's ambiguities. Yet their expertise often remains siloed. Recognizing and resourcing these roles could create durable ecosystems of support. For example, librarians could lead on sourcing and verification in AI-assisted literature reviews. Writing centers could integrate AI into coaching, helping students navigate tone and genre conventions while maintaining agency. Instructional designers could scaffold course-level AI experimentation with models and examples. Faculty developers could convene communities of practice that normalize reflection and disclosure. Together, these functions could build a distributed infrastructure of care and experimentation that legitimizes in-flight inquiry.

Equity and Global Perspectives

Equity must remain central to these shifts. Interviews and reflections revealed how access, language, institutional support, and geopolitical context all shape whether AI is a resource or a barrier. To treat AI as universal is to ignore these structural asymmetries. Institutions committed to responsible adoption must foreground questions of equity: Who has access? Whose language practices are privileged? What infrastructures are needed to make AI experimentation safe and generative for all scholars? By embedding equity into institutional responses, AI can be mobilized not only to accelerate tasks but also to widen participation in scholarship. Failing to do so risks reproducing exclusions and reinforcing the very barriers that AI might otherwise help dismantle.

CONCLUSION: PEOPLE-READY SCHOLARSHIP IN THE AGE OF AI

This paper has argued that AI is transforming not only how we research and design but also how we relate to knowledge, each other, and ourselves as scholars. The examples surfaced through interviews and written reflections show that AI is not a passing novelty or a neutral utility. Rather, it is a catalyst for rethinking the very norms and infrastructures that shape academic life. Research workflows, design practices, and pedagogical experiments are being reimagined in ways that foreground transparency, reflexivity, and collaboration. The challenge—and the opportunity—lies in whether institutions can respond with equal agility, legitimizing practices that are already reshaping the contours of scholarly identity.

At the heart of this transformation is what we have described as in-flight inquiry: a model of scholarship that values the provisional, the partial, and the emergent. Across the corpus, scholars used AI to revisit stalled projects, test ideas through simulated peer review, co-create usage statements with students, and narrate their own reflexive processes in real time. These practices resist the notion that only polished, final outputs count as knowledge. Instead, they position scholarship as iterative, dialogic, and transparent. Like Benjamin's constellations, in-flight inquiry treats fragments and iterations as meaningful contributions in their own right.

In-flight inquiry also carries an ethical dimension. The reflective logs, prompt histories, and scenario drafts shared by participants do more than record process—they cultivate trust. By documenting how ideas evolve in collaboration with AI, scholars create new forms of rigor rooted in disclosure and care. In design contexts, when instructors share usage statements with students, they signal belonging: inviting learners into the shared responsibility of shaping how AI is used. Across research and teaching alike, these practices suggest that rigor and care are not competing demands but mutually reinforcing values.

The implications extend beyond individual workflows. As we noted earlier, institutions must move toward infrastructures that legitimize mid-process scholarship. Communities of practice, reflective publishing formats, and cross-functional collaborations all provide pathways for making the invisible visible. Faculty developers, librarians, writing center staff, and instructional designers will be essential in scaffolding this transition, not only by providing technical support but also by modelling reflective disclosure and ethical experimentation.

Taken together, the field notes of this moment reveal more than a set of clever uses of new tools. They mark the emergence of a new scholarly orientation—one that values transparency over concealment, collaboration over isolation, and reflexivity over perfectionism. If the traditional model of scholarship

was built around the solitary author producing polished artifacts for delayed recognition, the model now taking shape is relational, provisional, and community-driven. It is scholarship that resists closure, honours emergence, and foregrounds the human values of trust, belonging, and care.

This orientation also brings us back to questions of authorship, remix, and assemblage. What counts as a scholarly artifact is shifting: prompt logs, usage statements, and collaborative drafts are not marginal notes but constitutive elements of the research and design process. Authorship is less about the solitary genius and more about assemblage—humans and machines co-creating texts that are then iterated and remixed within communities of practice. In this sense, AI does not displace scholarly agency but exposes its relational character, extending ongoing debates about the author function into new terrain.

Recognizing this shift could foster what we call people-ready scholarship: research and teaching that honours emergence, foregrounds trust and belonging, and recognizes process as a site of rigor. In this moment, the rules of scholarship are being written in real time. AI has exposed the limitations of legacy systems while opening space for new practices of rigor and recognition. The question is whether institutions will continue to hold these practices in the shadows or embrace them as foundational to the future of knowledge. To do the latter is to build a culture where transparency is rewarded, equity is prioritized, and reflexivity is seen as integral to scholarly excellence. At this critical juncture, our field must now grapple with how we might build scholarly cultures that honour emergence, not just arrival.

AI USAGE STATEMENT

Given the rapid evolution of generative AI practices, the authors affirm the importance of openness and transparency in disclosing AI use within academic work. Such statements not only support trust and accountability, but also contribute to the collective exchange of practice, enabling continued reflection on the role and positionality of AI in scholarly contexts.

In this project, generative AI was employed for specific, bounded tasks within the research process. AI-supported search tools—Elicit and Semantic Scholar—were used to assist in identifying initial articles for consideration in the literature review. Zoom’s native transcription tool and Descript AI were used to generate transcripts of Zoom interviews. ChatGPT Plus was used to produce summaries of blogger and author reflections as a point of comparison to the human-coded data summaries completed by the authors. Generative AI was not used in drafting the manuscript.

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Advancing Opened Culture in an AI-Enabled World

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ABSTRACT

The rapid emergence of artificial intelligence (AI) is reshaping the terrain of open education, presenting both opportunities for expanded access and risks of eroding long-standing values of equity, participation, and sustainability. This concept paper argues that openness in an AI-enabled world must be understood not as a default outcome of technological change, but as an intentional cultural practice. Building on prior global research, including the Dimensions of AI Literacies taxonomy (Gunder et al., 2024), the paper situates AI and open education within the framework of opened culture (Gunder, 2023), defined through the three dimensions of collaboration, creation, and connection. Through this lens, the paper examines how AI can support or undermine practices of belonging, authorship, and collective meaning-making, and highlights the critical role of plural, remixable literacies in guiding AI use. This analysis proposes that AI literacies serve not only as capabilities and skills to navigate learning ecosystems, but also as attitudes and perspectives on how AI might advance strategy and operations for more accessible, ethical, and impactful learning. By fostering cultures that are open by design and human by choice, educators and institutions can shape AI to help us strategically evolve the ways that we work together, what we build, and how we connect to those that we serve across our communities of learning.

Keywords

opened culture; AI literacies; constellating AI literacies; open education; collaboration; creation; connection; openness

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INTRODUCTION

The rapid proliferation of generative artificial intelligence (AI) has introduced profound disruptions and possibilities across the global education landscape. From automated writing assistants to AI-generated media, tools that were once considered futuristic are now commonplace in classrooms, libraries, and learning management systems. As these technologies evolve with unprecedented speed, so too do the questions they raise for equity, access, authorship, and agency in education. Within open education specifically—where transparency, adaptability, and community-driven creation are foundational principles—the arrival of AI has surfaced a paradox: the very tools that promise to expand access and lower barriers may also threaten the collaborative and human-centered values at the heart of openness.

This paper builds on globally recognized research conducted for MIT Open Learning and The William and Flora Hewlett Foundation (Gunder et al., 2025), alongside a longitudinal, commissioned international study by UNESCO IITE and Shanghai Open University. These parallel inquiries examined the rise of AI literacies among educators and the institutional conditions necessary to support their development. What emerged from this work was not only a taxonomy of eight distinct AI literacies—cultural, cognitive, constructive, communicative, confident, creative, critical, and civic—but also a broader insight: sustaining openness in an AI-enabled world requires more than digital fluency. It requires a cultural orientation toward meaning-making, collaboration, and care.

To investigate this cultural dimension of open education, this paper draws upon the work of Stuart Hall, who defined culture as “the practice of giving meaning to people, objects and events” (Hall, 1997). Adapting and extending Hall’s definition, our research collective has articulated the concept of opened culture as “a vibrant, active, sustainable, and enduring ecosystem that gives meaning to openness and educational access through collaboration, creation, and connection” (Gunder, 2023). These three dimensions—collaboration, creation, and connection—are a remix of Doug Belshaw’s foundational work on digital literacies (2014), and serve as the organizing structure for this paper. Rather than treating openness as a technical outcome or a policy imperative, we position it as a dynamic cultural practice expressed through these interdependent forms of meaning-making.

At this inflection point in the development of AI, open education is at risk of losing ground. Despite early optimism, many AI tools have undermined rather than advanced open values: platform opacity, data extraction, unequal access, and the erasure of authorship practices all threaten the gains made in global knowledge-sharing and education for the public good. Yet amid these challenges lies an opportunity: to reclaim the integration of AI into open education through intentional, literacies-driven approaches grounded in ethics, imagination, and equity.

In what follows, we explore how the three dimensions of opened culture—collaboration, creation, and connection—are being reshaped by AI. Drawing on insights from institutional leaders, instructional designers, faculty, librarians, and open education practitioners located across the globe, we illuminate both the risks and the transformative potential of AI in open ecosystems. Through this analysis, we propose that the Dimensions of AI Literacies taxonomy offers not a fixed path, but a generative vocabulary for guiding the ethical development of AI in education. It is through the development of these literacies—and their application to everyday educational practices—that we may collectively design a more inclusive and hopeful future for openness in an AI-enabled world.

COLLABORATION IN THE AGE OF THE INVISIBLE COLLABORATOR

As AI tools become increasingly embedded in education, collaboration is being reshaped—both in its visible practices and its cultural significance. In open education, collaboration has historically been defined through open pedagogical practices, including shared authorship, peer engagement, and collective resource creation (Cronin & MacLaren, 2018; Hegarty, 2015). These practices fostered not only co-production but also community, transparency, and mutual trust. With the advent of generative AI, however, new collaborative dynamics are emerging that complicate these long-standing norms (Gunder et al., 2025). AI-enabled tools streamline tasks such as translation, summarization, and brainstorming, but often do so in ways that obscure their involvement. This invisibility creates a false sense of solitary production, where the educator appears to operate alone while relying on machine assistance behind the scenes. The result is a form of collaboration that is hidden from view—efficient, but opaque.

This shift is far beyond technical and operational issues and carries deep cultural implications. When AI replaces or augments parts of the educational design process, it becomes increasingly difficult to know where human intention ends and algorithmic suggestion begins. Without clear norms or shared vocabulary for identifying and discussing AI's role, collaboration becomes a private act, rather than a shared one. The relational dimensions of collaboration—trust, iteration, feedback—are replaced with individualized workflows, which can erode the collective culture of openness that underpins open education. Some educators express discomfort with these shifts, especially when AI usage is perceived as undermining intellectual labour. Others describe hesitancy to share AI-enhanced work due to concerns about perception, authorship, or the fear of public shaming. In this context, collaboration is not just challenged by new tools—it is challenged by new cultural pressures that privilege perfection over process and individual performance over shared experimentation.

Toward an Ethic of Shared Experimentation

Despite these tensions, new forms of collaboration are taking root—ones that reflect the spirit of open education while adapting to the realities of AI integration. These emerging practices are not grounded in perfection, but in dialogue. Educators are coming together to co-prompt generative models, compare outputs, and reflect on how AI tools can augment rather than replace their work. In these spaces, collaboration is not defined by product, but by process: a mutual inquiry into what it means to teach and design ethically in an AI-mediated world.

This shift reflects a broader cultural reorientation. In contrast to performance-driven collaboration, which rewards final deliverables and polished outputs, these practices embrace collaboration as iterative, relational, and uncertain. Risk-taking becomes acceptable—valuable, even—when educators feel psychologically safe to share what they are learning, even when the outcomes are imperfect. This kind of safety is essential for innovation. Collaboration, in this sense, becomes a space not just for knowledge exchange, but for values alignment. Educators are grappling with questions about how to credit AI tools, how to disclose their use, and how to uphold the principles of openness in environments shaped by proprietary technologies. These questions are not only technical—they represent cultural and communicative AI literacies (Gunder et al., 2024). They speak to the need for collective sense-making about what collaboration means in the age of the algorithm.

When collaboration is grounded in shared experimentation, it resists the isolating effects of AI tool use. Instead of relying on AI to bypass human interaction, these practices position AI as a prompt for

conversation. In this model, the goal is not simply to make work faster or easier, but to deepen understanding, surface tensions, and co-create ethical pathways for teaching and learning.

Infrastructure, Equity, and the Conditions for Participation

For collaboration with and around AI to thrive, certain conditions must be in place. Infrastructure plays a central role—not only in terms of technology access, but also in terms of institutional culture and support. When educators have access to reliable tools, time to experiment, and collegial spaces to share practices, collaborative innovation becomes more likely. Conversely, when access is limited or when institutional narratives frame AI as a threat, collaboration can become constrained or even discouraged.

This disparity has equity implications. Educators and learners at under-resourced institutions may not have access to paid AI tools or protected time for exploration. They may also lack institutional policies that support thoughtful experimentation. In such contexts, AI is not an enabler of collaboration—it is a gatekeeper that privileges those with more resources, infrastructure, and institutional backing. Without intentional efforts to cultivate equitable conditions, AI risks reinforcing the very inequities that open education seeks to address.

Collaborative AI practices also depend on clarity—about goals, norms, and expectations. Without shared guidelines, educators may adopt vastly different approaches to disclosing AI use, attributing authorship, or evaluating AI-generated work. These differences can lead to misunderstandings, undermine trust, and fragment communities of practice. Developing shared language and protocols can mitigate these challenges, allowing collaboration to flourish on a foundation of transparency and mutual respect.

The Dimensions of AI Literacies taxonomy (Gunder et al., 2024) offers a foundation for building such shared understanding. Cultural AI literacies help educators interrogate the norms and assumptions that shape collaboration in AI-enabled environments. Communicative AI literacies support effective meaning-making across human and machine actors. Critical AI literacies surface questions about bias, power, and institutional responsibility. Together, these literacies provide educators with the tools to engage in collaboration that is not only technologically fluent, but also ethically grounded.

Collaboration As a Cultural Practice in Open Education

Ultimately, collaboration in an AI-enabled open education landscape must be understood as a cultural practice—one that reflects deeper values, identities, and power dynamics. It is not enough to add AI tools into existing workflows and expect collaborative cultures to remain intact. Instead, institutions and individuals must reconsider how collaboration is designed, supported, and rewarded. This requires moving beyond binary thinking. Collaboration is no longer simply human or machine, synchronous or asynchronous, authored or assisted. It is a complex, evolving interplay of actors, tools, intentions, and contexts. In this interplay, educators are called not only to adapt, but to lead. They are invited to shape what collaboration looks like in a world where intelligence is distributed, data is abundant, and meaning is made collectively.

Open education has long championed collaboration as a driver of innovation and equity. In the age of AI, that commitment must expand—not only to protect the values of openness, but to reimagine them. Collaboration must remain visible, intentional, and inclusive. It must resist isolation and perfectionism. It must invite curiosity, vulnerability, and care. In this vision, AI is not the invisible collaborator. It is a

provocation—a tool that invites us to return to the heart of open education: the human work of learning together.

CREATION BEYOND THE PROMPT: DESIGNING WITH PURPOSE, REMIXING WITH INTEGRITY

AI has lowered barriers to creative production, enabling more people to generate text, images, audio, and video at a pace and scale previously unimaginable. In education, these capabilities appear promising for expanding access to creation, translation, and remixing. Yet not all outputs generated by AI tools align with the values of openness. The capacity to create does not guarantee that what is created contributes to a culture of inclusion, transparency, or equitable participation. To understand what is at stake, it is necessary to interrogate how AI reshapes practices of authorship, attribution, and design, as well as how educators might reclaim creativity as a purposeful and ethical act.

Creativity As Extension or Substitute

A central tension in AI-enabled creation is whether these tools are used to extend human creativity or to substitute for it. When AI functions as a tool for ideation, it can open new pathways for experimentation, helping learners generate possibilities that might otherwise remain inaccessible. This aligns with the ethos of open pedagogy by democratizing entry points to creative processes (DeRosa & Jhangiani, 2018; Jhangiani, 2019). However, when AI becomes a surrogate for originality—replacing rather than expanding human expression—it risks undermining both creative agency and the values that sustain open education.

The distinction between extension and substitution is not always clear in practice. Educators experimenting with generative models may find themselves oscillating between moments where AI amplifies their vision and moments where it steers them toward generic or homogenized outputs. These tensions point to the importance of cultivating critical awareness and intentionality when working with AI. Creativity, in this sense, is not about accepting outputs at face value, but about interrogating their origins, assumptions, and implications (Gupta et al., 2024; Ng et al., 2021). It is in this reflective work that AI can serve as a catalyst for more purposeful and values-driven design.

Openness and curiosity play a critical role in enabling this reflective stance. Creative engagement with AI requires a willingness to explore, to ask why certain outputs appear, and to trace the cultural or computational biases embedded in them. At the same time, many educators carry self-doubt rooted in impostor phenomenon around creativity, questioning whether their contributions are original or worthy. These feelings can be exacerbated by AI tools, which present polished results in seconds. Without cultivating openness to imperfection and curiosity about the process, educators may defer to machine outputs rather than using them as material to remix and reshape in ways that honour their own voices and values, as well as the voices that came before theirs that AI tends to erase by stripping away attribution and context.

Attribution, Authorship, and the Ethics of Transparency

Another challenge in AI-mediated creation concerns attribution and authorship. In traditional scholarly and creative work, norms of citation and acknowledgment function to ensure transparency, traceability, and accountability. With AI-generated content, these norms are unsettled. Who is the author of a text drafted by a generative model? What does it mean to attribute credit when the output

draws on countless training data sources? Should the use of AI tools be disclosed even when the content is substantially edited by a human?

Many educators remain reluctant to disclose AI use, fearing that doing so will diminish perceptions of their expertise or authenticity. This reluctance reflects cultural stigma as much as it does ethical uncertainty. Concealment, however, conflicts with the values of openness that underlie open education. When AI is hidden, the opportunity for collective reflection on its role in shaping meaning is lost. By contrast, transparent disclosure allows communities to learn together, interrogate boundaries, and establish ethical practices for attribution.

Critical debates on authorship from fields such as feminist pedagogy and cultural studies illuminate the stakes of this moment. Scholars such as bell hooks have argued that authorship is not simply about ownership, but about responsibility—particularly in contexts where representation carries consequences for whose voices are amplified or erased (hooks, 1994). Applying this lens to AI, ethical creation requires more than disclosing tool use; it requires accountability for the cultural and political implications of what is produced.

Openness, Curiosity, and Creative Literacies

To sustain creativity in the age of AI, educators must embrace creativity not only as a skillset, but as a mindset. Creative AI literacies emphasize the ability to generate, adapt, and remix ideas with intentionality. Constructive AI literacies involve knowing how to work within AI-enabled environments to build new artifacts. Confident AI literacies underscore the importance of self-assurance in experimenting with unfamiliar tools without deferring uncritically to them. Together, these literacies form a constellation of practices that enable educators to create with purpose, remix with integrity, and navigate the tensions of machine-assisted production (Gunder, 2024; Gunder et al., 2024).

Openness and curiosity serve as conditions that make these literacies possible. When educators bring openness to experimentation, they are more likely to see AI outputs as starting points rather than finished products. Curiosity allows them to ask questions about the processes behind machine generation and to remain attentive to the cultural assumptions embedded in training data. By contrast, when educators approach AI with closed mindsets or self-doubt, creativity becomes constrained. Imposter phenomenon—doubting one's own originality—can cause educators to rely excessively on machine outputs, inadvertently reproducing generic or biased patterns instead of pushing against them.

Designing learning environments that foster openness and curiosity is, therefore, essential. This includes creating pedagogical spaces where experimentation is safe, imperfection is valued, and reflection is normalized. In such spaces, AI becomes not a replacement for human creativity, but a medium through which creativity is amplified and reoriented toward shared values.

Cases-In-Practice: Learning with and Through Creation

Examples from educational practice illustrate both the promises and pitfalls of AI-enabled creation. In collaborative projects that bring together students and educators across institutions, generative AI has been used to brainstorm concepts, generate visual representations, and facilitate translation across languages. These affordances expand access to participation, particularly for learners who may lack confidence in traditional forms of academic production. At the same time, challenges emerge when outputs reproduce stereotypes, oversimplify nuance, or obscure the origins of source material.

Projects such as collective explorations of the future of educational technology highlight the double-edged nature of AI-assisted creation. On the one hand, AI can accelerate idea generation, allowing participants to visualize and test scenarios in real time. On the other hand, the very speed of these processes can inhibit deeper engagement, leading to outcomes that feel derivative rather than transformative. To counteract this, facilitators must intentionally slow down the process, encouraging participants to remix, critique, and contextualize outputs rather than simply accept them.

In classroom contexts, assignments that incorporate generative tools for information design have shown potential to cultivate constructive literacies. Students learn not only how to use AI to create, but also how to evaluate and adapt outputs in line with disciplinary standards and ethical considerations. These assignments surface critical conversations about originality, bias, and representation, illustrating how AI can become an entry point for broader reflection on authorship and integrity.

Resisting Harmful Representation

Ethical creation also requires vigilance against harmful representation. Generative image tools, for example, have been documented to reproduce stereotypes and distort cultural identities. Requests for images of educators, leaders, or students from marginalized backgrounds often yield misrepresentations that reinforce exclusionary narratives (Sadeghiani, 2024; Zhou et al., 2024). Such distortions are not accidents; they reflect the biases of the training data and the social structures embedded within it.

Resisting these harms requires cultivating critical AI literacies alongside creative engagement. Educators must teach learners not only how to produce with AI, but also how to critique and resist outputs that perpetuate inequality. This involves both technical understanding—recognizing how models generate outputs—and cultural awareness—interrogating whose perspectives are privileged or erased. In open education, where the goal is to expand access and representation, this vigilance is particularly vital.

Creation As a Cultural Practice of Open Education

Creation in the age of AI must ultimately be understood not as an isolated act of production, but as a cultural practice that reflects and shapes values. To design with purpose and remix with integrity means approaching AI tools as partners in meaning-making, rather than as surrogates for originality. It means acknowledging the conditions of creation—technological, cultural, and societal—that shape what is possible and who is included. And it means cultivating literacies that empower educators and learners to create in ways that advance openness, equity, and societal good.

Openness and curiosity are not incidental to this work—they are foundational. Without openness, educators cannot bring their values into dialogue with machine outputs. Without curiosity, they cannot interrogate the assumptions embedded in those outputs. Together, these dispositions enable creativity that is not only productive but also transformative. They allow AI to serve not as a replacement for human imagination, but as a medium through which the values of open education can be enacted and expanded.

CONNECTION ACROSS DISTANCE: OPEN COMMUNITIES IN A TIME OF AUTOMATION

In open education, connection has never been reducible to mere communication. It is rooted in relationships, belonging, and shared purpose. Learners and educators who participate in open communities do so not only to exchange knowledge but to engage in meaning-making together. This sense of connection fosters trust, solidarity, and the collective pursuit of more just and accessible educational futures. Yet as AI systems become embedded in teaching and learning, the very nature of connection is being challenged.

AI tools increasingly mediate interactions between learners and educators. Automated feedback, generative tutoring systems, and algorithmically driven personalization promise efficiency and scale. But these affordances can come at the expense of genuine human connection. When relationships are replaced by automation, learners risk experiencing education as a transactional service rather than a communal practice. The values that have long underpinned open education—mutual support, dialogic exchange, and shared inquiry—become obscured behind interfaces optimized for performance and productivity. The challenge, then, is not whether AI will shape the conditions of connection, but how educators and communities will respond. Will open education embrace AI as a tool that strengthens belonging and reciprocity, or will it allow connection to be hollowed out by automated systems that privilege scale over solidarity?

Connection As Belonging and Purpose

To sustain meaningful connections in AI-enabled education, it is necessary to distinguish between communication and community. Communication can be automated—an AI-generated comment on an essay, for example, may approximate feedback. But community cannot be automated. Community requires a sense of belonging, the recognition that one's presence matters, and the understanding that participation is part of a shared journey. Generative systems that replace human feedback with automated responses risk undermining this foundation. While learners may receive technically accurate guidance, they may also feel unseen or undervalued. Education becomes a process of information exchange rather than a practice of collective growth. The relational dimension of learning—what makes it open, human, and transformative—diminishes.

This danger extends to personalization. AI-driven personalization often relies on proprietary algorithms that collect, analyse, and act upon learner data. While marketed as tailored support, these systems can reproduce inequities by embedding bias, limiting learner agency, and prioritizing efficiency over exploration (Ossiannilsson et al., 2024; World Economic Forum, 2022). In open education, personalization must instead be values-aligned: grounded in transparency, learner choice, and respect for diversity of pathways. Connection, in this sense, is not about tailoring a solitary experience, but about cultivating spaces where learners' identities and contributions are valued as part of a collective whole.

The Inequities of Connection

AI does not distribute opportunities for connection evenly. Tools and infrastructure remain unevenly accessible, shaped by geographic, economic, and institutional disparities. In well-resourced contexts, learners may access state-of-the-art platforms and experiment with cutting-edge generative tools. In under-resourced settings, however, learners may confront paywalls, bandwidth limitations, or outright

exclusion from emerging technologies. These disparities risk exacerbating global inequalities in education—directly undermining the Sustainable Development Goals (UNESCO, 2024), particularly the sustainable development goal (SDG) 10, reducing inequality. Even SDG 4, which emphasizes inclusive and equitable quality education, is complicated by AI. On one hand, AI can expand access through translation, accessibility features, and adaptive supports that help learners cross linguistic and cultural barriers. On the other hand, AI’s environmental impact—its high energy consumption and reliance on extractive labour in data labelling—undermines progress on other SDGs, including those related to climate action and decent work (Santarius et al., 2023; UNESCO, 2024). The paradox is stark: AI may advance education for some while harming the very conditions necessary for sustainable futures. Connection in open education cannot be sustained if these inequities persist. To ensure that AI supports rather than fractures community, educators must foreground equity in their design and adoption decisions. This requires not only distributing access more fairly but also cultivating awareness of the hidden costs and externalities of AI systems.

Connectivist and Constructivist Strategies for Connection

Educational theories of connection offer pathways forward. Constructivism highlights that knowledge is built through active engagement and shared problem-solving (Vygotsky, 1978). Connectivism emphasizes that learning occurs through networks of people, resources, and technologies (Siemens, 2005). Together, these approaches underscore the importance of agency and reciprocity in shaping learning environments.

AI can be deployed in ways that reinforce these principles. For example, generative tools can serve as prompts for collaborative exploration, where learners critique, remix, and build upon machine-generated outputs as part of a group process. In this context, AI functions not as a replacement for human interaction, but as a catalyst for dialogue. Similarly, translation systems can expand access to global conversations, enabling participants from different linguistic backgrounds to engage in co-construction of knowledge. What distinguishes these practices from extractive or isolating uses of AI is their orientation toward community. Rather than personalizing education into atomized experiences, connectivist and constructivist strategies harness AI to strengthen relationships, amplify voices, and sustain shared meaning-making. They reflect a recognition that connection in open education is not an individual pursuit, but a collective endeavour.

The Role of AI Literacies in Sustaining Connection

Sustaining meaningful connections in the age of AI requires the cultivation of specific literacies (Gunder et al., 2024). Civic AI literacies help educators and learners understand how AI can be used for societal benefit, while also interrogating how it might undermine collective goals. Cultural AI literacies encourage awareness of the norms, values, and practices that shape AI-mediated interactions, enabling communities to resist proprietary systems that commodify connection. Cognitive AI literacies build understanding of how AI tools function, equipping individuals to discern when automation is helpful and when human intelligence is indispensable.

Developing these literacies is essential to reclaiming agency in the design of connection. They enable communities to evaluate when AI strengthens belonging and when it erodes it, when it facilitates access and when it entrenches inequity. Literacies, in this sense, are not peripheral to connection—they are the very means by which communities can sustain openness in the face of automation.

The cultivation of literacies also reflects a deeper cultural stance. Connection in open education has always been about more than content delivery; it is about how people gather, belong, and serve. By equipping educators and learners with the literacies to critically engage AI, open communities can ensure that automation does not displace their values but becomes an arena in which those values are actively enacted.

Connection As a Practice of Opened Culture

In the end, connection must be reclaimed as a cultural practice of opened culture—one that cannot be automated, outsourced, or scaled away. Open communities thrive when relationships are visible, belonging is prioritized, and purpose is shared. AI will undoubtedly continue to influence the ways people interact in educational spaces. But whether those interactions foster community or undermine it depends on choices made by educators, institutions, and learners themselves. The task ahead is not to resist AI outright, but to guide it toward purposes that align with openness and justice. By centering human relationships, cultivating critical literacies, and foregrounding equity, open education can ensure that connection across distance remains grounded in care rather than automation. In doing so, it can advance not only the goals of open education but the broader pursuit of sustainable and just futures.

CONSTELLATING AI LITERACIES: A FRAMEWORK FOR FUTURE-READY OPENNESS

The emergence of AI within education has spurred urgent calls for guidance on how to navigate its promises and perils. Much of the early discourse has framed AI readiness in instrumental terms—focusing on technical proficiency, compliance with institutional policies, or narrow skill acquisition. Yet such approaches miss the deeper cultural, ethical, and relational dimensions of what it means to live, work, and learn alongside AI. To meet this moment, educators require more than a checklist of competencies; they need a constellation of literacies that orient them toward purposeful, values-driven action (Gunder et al., 2024).

The Dimensions of AI Literacies taxonomy offers one such constellation. Developed from global research on educator perspectives, it articulates eight interrelated literacies that span both skillsets and mindsets. Rather than prescribing static outcomes, the taxonomy emphasizes a plural and remixable approach. Literacies are not endpoints to be mastered, but dispositions and practices to be cultivated, adapted, and reinterpreted across contexts. They evolve as tools shift, as communities redefine priorities, and as global challenges demand new forms of collective response.

A Sociocultural Constellation of Literacies

Framing AI literacies as a constellation underscores their sociocultural grounding (Gunder, 2024). Just as constellations are patterns we give to stars to make sense of the night sky, literacies are actions and attitudes we give meaning to in order to navigate the shifting landscape of AI. The taxonomy reflects this by positioning literacies not as universal checklists, but as situated practices shaped by culture, context, and community (Gunder et al., 2024).

The plural character of the taxonomy resists reductive understandings of AI readiness. It recognizes that what matters is not simply whether one can operate a given tool, but whether one can engage critically with how that tool shapes power, participation, and possibility. Literacies are thus less about

technical mastery than about cultivating awareness of meaning-making practices. This sociocultural orientation distinguishes the taxonomy from more technocratic approaches, aligning it with traditions in literacy studies that highlight the socially situated nature of knowledge and practice (Street, 1984; Collins & Blot, 2003).

Intersections With the Three Dimensions of Opened Culture

The taxonomy gains particular resonance when mapped onto the three dimensions of opened culture—collaboration, creation, and connection. Each dimension aligns with a constellation of literacies that illuminate how AI reshapes cultural practice.

In the realm of collaboration, cultural, communicative, and critical literacies are essential. Cultural literacies sensitize educators to the norms and practices that shape how AI is used in collective work. Communicative literacies equip them to convey meaning purposefully with and through AI. Critical literacies enable interrogation of how AI systems embed power and bias, ensuring that collaboration does not reproduce inequities but advances openness.

In the domain of creation, constructive, creative, and confident literacies come to the fore. Constructive literacies involve building and operating effectively within AI-enabled environments. Creative literacies emphasize generating and remixing ideas with intentionality and integrity. Confident literacies cultivate self-assurance to experiment with AI without ceding agency to it, empowering educators to create in ways that align with their values.

Within the dimension of connection, civic and cognitive literacies are paramount. Civic literacies frame AI use in terms of societal benefit and collective responsibility, linking educational practice to broader commitments such as the Sustainable Development Goals. Cognitive literacies involve understanding how AI tools function, enabling discernment about when to rely on machine assistance and when to prioritize human intelligence. Together, these literacies sustain connection as belonging and shared purpose rather than as an automated transaction.

Mapping the taxonomy onto the three dimensions of opened culture demonstrates its integrative potential. Literacies are not siloed, but interdependent, weaving together to support collaboration, creation, and connection in ways that give enduring meaning to openness.

AI Literacies as Strategic Tools for Institutions

While the taxonomy provides a vocabulary for individual educators and learners, its implications extend to institutional and systemic levels. AI literacies can serve as strategic tools for leadership, guiding professional development, curriculum design, and policy formation. By adopting the taxonomy, institutions can move beyond reactive pivots in response to AI disruptions toward proactive cultivation of cultures that align technology use with educational values.

For leadership, the taxonomy offers a way to articulate priorities and build shared understanding across stakeholders. Rather than debating whether AI is good or bad for education, leaders can ask how particular literacies are being developed and enacted in their contexts. This reframing supports more nuanced and values-centered decision-making.

In professional learning, the taxonomy can help educators reflect on their own practices and identify areas for growth. It provides a language for discussing not only technical skills, but also the cultural,

critical, and civic dimensions of AI engagement. Such reflection fosters communities of practice where educators support one another in developing literacies collectively.

At a global scale, positioning AI literacies as strategic tools supports the goals of open education movements. By emphasizing pluralism, remixability, and adaptability, the taxonomy aligns with the pursuit of equitable and inclusive futures. It also connects with global commitments such as SDG 4 on quality education, while acknowledging the tensions AI raises for sustainability, labour, and equity. As institutions integrate AI into their practices, the taxonomy helps ensure that openness remains a guiding principle rather than a casualty of technological change.

Future-Ready Openness

The work of constellating AI literacies is ultimately about preparing for futures that are not yet fully known. Just as constellations shift as observers move across geographies and cultures, so too will the meanings and practices of AI literacies shift as tools, needs, and communities evolve. By embracing this dynamism, educators and institutions can cultivate forms of openness that are resilient, adaptable, and ethically grounded. Future-ready openness requires recognition that AI will continue to transform educational practices, but that these transformations are not predetermined. Through intentional cultivation of literacies, educators can shape how AI is integrated—whether it entrenches inequities or expands access, whether it erodes relationships or strengthens them, whether it narrows creativity or multiplies it. The taxonomy does not prescribe a single path, but provides a compass for navigating complexity with care and clarity. In this sense, the Dimensions of AI Literacies taxonomy is less a framework to be followed than a cultural stance to be enacted. It invites educators, leaders, and learners to see themselves as co-constellators—active participants in shaping how openness will be practiced in an AI-enabled world. By designing with purpose, remixing with integrity, and connecting with care, open education can chart a future where AI serves not as a disruption to be endured, but as a medium through which openness is continually renewed.

CONCLUSION: OPEN BY DESIGN, HUMAN BY CHOICE

The integration of AI into education presents both extraordinary possibilities and unprecedented risks. Left unchecked, AI will not default toward equity, inclusion, or access. Its trajectory is shaped by economic interests, technical constraints, and entrenched power structures that often privilege efficiency over justice. If open education is to endure and flourish in this new era, its practitioners must take intentional steps to ensure that openness is not eroded but expanded. This requires recognizing that AI is not neutral—it is a cultural force that will reflect and amplify the values of those who design, deploy, and critique it.

Open education has always been more than a set of tools or policies. It is a cultural practice—relational, participatory, and enduring. The concept of opened culture, defined through the dimensions of collaboration, creation, and connection, provides a lens for understanding how AI might be guided toward purposes that strengthen rather than weaken the foundations of openness. Through this lens, openness becomes not simply an outcome of access, but a stance of meaning-making that privileges community, care, and co-agency.

AI Literacies as a Compass

To sustain this stance, educators, leaders, and learners must cultivate literacies that enable them to navigate the complexity of AI with clarity and purpose. The Dimensions of AI Literacies taxonomy

serves as a compass for this work. It highlights not only the technical skills required to interact with AI systems, but also the cultural, civic, and critical dispositions that ensure such interactions align with human values. AI literacies can guide decisions at every level. In teaching and learning, they help educators integrate AI in ways that empower rather than diminish learners. In leadership, they provide a shared vocabulary for shaping institutional policies and professional development that prioritize equity and openness. At the level of global policymaking, they offer principles for ensuring that AI supports rather than undermines collective goals such as the Sustainable Development Goals (Gunder et al., 2025). The cultivation of literacies is not ancillary to the future of education—it is central. Without them, institutions risk ceding agency to proprietary systems that define what counts as learning, who has access, and whose voices are heard. With them, educators can reimagine AI not as a force of control, but as a catalyst for co-liberation: a means of expanding human capacity, fostering creativity, and deepening collective purpose.

A Vision of Resilient Open Cultures

The challenge ahead is not merely to integrate AI, but to design cultures of openness resilient enough to endure and adapt. Such cultures cannot be built by isolated individuals or institutions. They require global networks of practice—communities that share knowledge, remix ideas, and collaborate across difference to confront the shifting landscape of education. Resilient cultures of openness will be those that hold fast to human values while embracing technological change with curiosity and care. They will prioritize belonging over automation, creativity over replication, and connection over commodification. They will recognize that openness is not a finite resource to be distributed, but an active practice that must be continually enacted and renewed. In this vision, AI does not dictate the future of education. Instead, it becomes one medium through which educators and learners enact their values of openness. The taxonomy of AI literacies provides the tools to navigate this path, but it is the collective commitment to openness that ensures the journey leads toward just and sustainable futures.

The call to action is clear: openness in an AI-enabled world must be designed, defended, and sustained by choice. By embracing AI literacies as a compass, reimagining openness as a cultural practice, and building resilient global networks of practice, the education community can guide AI toward purposes that serve humanity rather than diminish it. What emerges is not a future of control, but one of co-liberation—a future where AI expands the possibilities of openness, and where openness, in turn, shapes AI as a tool for equity, creativity, and shared flourishing.

AUTHOR NOTES

AI Usage Statement

Given the rapid evolution of generative AI practices, the authors affirm the importance of openness and transparency in disclosing AI use within academic work. Such statements not only support trust and accountability, but also contribute to the collective exchange of practice, enabling continued reflection on the role and positionality of AI in scholarly contexts.

In this project, generative AI was employed for specific, bounded tasks within the research process. AI-supported search tools—Elicit, Consensus, and Semantic Scholar—were used to assist in identifying initial articles for consideration in the literature review. Transcripts were created of the Zoom

interviews using Zoom's native transcription tool, as well as Whisper AI. Chat GPT Plus was used to create transcripts of Zoom interviews and to generate summaries of transcript text from interview data (offered with informed consent) as a resource for comparison against the human-coded data summaries prepared by the research team. Generative AI was not used for the writing of the manuscript.

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AI and the Future of Institutional Leadership: Global Collaborations for Strategy and Innovation

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ABSTRACT

As institutions navigate the uncertain terrain of artificial intelligence in higher education, the emergence of global collaborations has created new opportunities to reimagine academic leadership and institutional strategy. This concept paper explores how a partnership between The University of Texas at San Antonio and several institutions in Australia, Europe, and Asia evolved into a broader transnational dialogue on the future of learning, governance, and innovation. Grounded in a relational approach to strategy, the authors argue that academic innovation is most impactful when built on trust, cultural responsiveness, and shared values. Drawing on narratives of co-leadership, operational reciprocity, and adaptive frameworks, the paper presents a remixable blueprint for institutions seeking to move beyond tool adoption toward coalition-building and collective capacity. Ultimately, it positions AI as a catalyst for deeper institutional reflection—revealing how collaborative models of strategy development can be leveraged not only to address emerging technologies, but to design more inclusive and responsive futures for higher education.

Keywords

artificial intelligence; global collaboration; academic innovation; AI strategy; creative literacies; community of practice; faculty learning communities; adaptive leadership; ethical governance

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INTRODUCTION

As artificial intelligence (AI) reshapes nearly every dimension of learning, higher education institutions face mounting pressure to respond with agility, vision, and coherence. Much of the initial energy surrounding AI in teaching and learning has focused on technical upskilling, enforcement of institutional policies, and regulating student use of generative tools. Yet this emphasis on containment and compliance obscures a deeper shift: AI is not simply a technology to be managed—it is a catalyst for reimagining how institutions lead, collaborate, and adapt in an era of accelerating complexity.

This early wave of “AI policy enforcement” has often defaulted to reactive, restrictive models—developing standalone rules for student use of generative tools without engaging the broader digital policy ecosystem already in place. These policies are frequently built on anecdotal evidence and assumptions about misconduct, rather than data-informed understanding of how students and faculty are actually experimenting with AI. Such approaches risk locking institutions into rigid frameworks that cannot keep pace with the rapid evolution of the technology. Additionally, in many institutions, student voices remain notably absent from strategic conversations, despite their role as primary users, co-creators, and critics of these emerging tools. An alternative model calls for guidelines or “policy in pencil”—strategies that are flexible, reflective, and co-developed through campus-wide dialogue. This includes systematically engaging a broader cross-section of stakeholders—especially students—to understand not only practices, but perspectives, as well as continually revisiting these guidelines and challenges and opportunities evolve.

At The University of Texas at San Antonio (UT San Antonio), the institutional response to AI began not with policy enforcement, but with a commitment to dialogue. Early efforts focused on fostering conversation and connection within and across departments, disciplines, and roles. Faculty development teams catalyzed internal learning communities that shared emerging AI practices, surfaced concerns, and began identifying opportunities for strategic alignment. These intra-institutional efforts soon expanded into broader dialogue across the University of Texas system, with UT San Antonio leading multiple system-wide convenings on AI and academic innovation. The move to global engagement was not an isolated initiative, but a natural extension of a culture already committed to open inquiry, experimentation, and multi-stakeholder learning.

The global faculty learning community (FLC) co-developed with Swinburne University of Technology (SWUT) in Australia marked a key inflection point in this journey. Framed as a community of practice rather than a compliance exercise, it offered faculty a space to explore AI’s potential through peer dialogue, collaborative reflection, and cross-cultural exchange (Huffman et al, 2016). While initially focused on pedagogy, the FLC surfaced broader questions around leadership readiness, institutional culture, and global strategic alignment (Gunder et al., 2025). It modelled a form of professional learning that was relational, iterative, and strategically catalytic—laying the groundwork for an expanded vision of what institutional collaboration around AI could look like. That expanded vision is now taking shape. AI is increasingly treated not as a standalone innovation, but as a prism through which institutions can examine and reconfigure their broader approach to academic innovation. Institutions are now coordinating AI strategy across pedagogy, operations, and governance—a move echoed in frameworks like WCET’s Policy and Practice Framework (2023), which calls on institutions to build cross-functional capacity around AI adoption. These efforts are not just about AI readiness; they are about designing inclusive, values-driven systems that can respond to emerging technologies with care, creativity, and coherence.

This concept paper explores how global partnerships are evolving from practice-sharing spaces to coalitions of strategic innovation. Drawing on lived institutional experiences across multiple regions, it traces how cross-institutional communities have shifted from grassroots experimentation to multi-level coordination of academic transformation. The paper argues that the most impactful AI work is not confined to isolated pilots, but emerges from inclusive ecosystems that foreground creativity, openness, and collective sensemaking. The structure of the paper reflects this arc of evolution. The next section examines the transformation of communities of practice into leadership coalitions, grounded in mutual infrastructure and shared strategic intent. We then explore the cultural dimensions of this work, including how institutions are centering trust, creativity, and co-leadership in their approach to AI and academic transformation. Subsequent sections examine how global partners are engaging in operational transparency and strategic reflection, and offer a framework for values-based innovation networks that prioritize ethical pluralism and contextual responsiveness. The paper concludes with a call to action: to treat global partnerships not as supplements to institutional strategy, but as central mechanisms through which AI leadership—and academic innovation more broadly—can be reimagined for the future of higher education.

COLLABORATION AS INFRASTRUCTURE: FROM COMMUNITIES OF PRACTICE TO STRATEGIC COALITIONS

In the earliest stages of institutional AI experimentation, countless faculty, staff, leaders, and students navigated their questions in isolation. There were few formal support structures, and even fewer opportunities to openly discuss early use of generative AI tools. Concern over academic integrity, uneven levels of digital capabilities, and inconsistent messaging across units contributed to a climate of uncertainty. Rather than surfacing their experimentation, many educators and learners worked quietly, unsure of how their practices would be received. Against this backdrop, a small number of grassroots efforts began to emerge—early learning communities that sought to build trust, identify shared challenges, and create space for exploratory dialogue.

At UT San Antonio, these early communities signalled a different institutional posture. Rather than leave innovation to happen at the margins, academic leaders encouraged cross-departmental collaboration, inviting educators from diverse disciplines, and at times from other institutions, to learn together and document evolving AI practice. These gatherings offered more than just professional development; they cultivated a relational foundation for the institution's broader innovation strategy. By fostering community expectations and guidelines before codifying policy, UT San Antonio created the conditions for alignment without stifling experimentation. The model of the community of practice (CoP) provided a powerful foundation for this work. As theorized by Wenger, CoPs are formed through mutual engagement, joint enterprise, and a shared repertoire of language and practice (1999; 2011). They rely on trust, reciprocity, and a commitment to co-learning. At UT San Antonio, the early learning communities modelled these principles by centering the lived experience of faculty and staff. The goal was not to produce consensus, but to create shared infrastructure—a space where emerging questions could be addressed collectively, even when definitive answers remained out of reach.

From Local Learning to Global Alignment

As internal communities matured, their impact began to stretch beyond individual geographical interpretations of academic innovation in the age of AI. The decision to expand these conversations

globally, through a formal partnership with SWUT, reflected the same CoP values that had shaped the institution's internal work. Rather than position itself as a model to be exported, UT San Antonio approached the collaboration as an opportunity for reciprocal inquiry. The resulting global faculty learning community provided space for both institutions to surface tensions, share frameworks, and experiment with new ways of framing AI within their institutional cultures.

The partnership centered not on tool adoption, but on pedagogical values—particularly the role of creativity, ethics, and student agency in AI-integrated learning environments. Across both institutions, participants engaged in reflective dialogue about institutional positioning, academic integrity, student support, career readiness for students, and faculty development. These sessions blurred the line between learning and leadership. They became a space for surfacing strategic questions—about how policies were developed, who was consulted, and how AI fit into broader narratives of institutional change.

Trust was essential to this process. Neither institution presented itself as the expert. Instead, they co-created a space for unfinished thinking, where insights were not only exchanged but evolved through conversation. This mutual alignment did not require uniformity; each institution retained its distinct context and goals. But the partnership created a shared language and rhythm for learning—an infrastructure of relationship that allowed new questions to emerge and be explored together.

Framing Collaboration as Strategic Infrastructure

As time passed, the work sharing AI strategy moved upstream from pedagogy into governance, communications, and cross-functional approaches. Questions that started in the classroom—about AI use, authorship, and student support—surfaced gaps in institutional messaging and clarity of expectations. These insights helped catalyze broader efforts to align academic, operational, and strategic priorities. What emerged through this work was a deeper understanding of how collaboration functions not just as a method of knowledge sharing, but as a form of strategic infrastructure. Peer leadership networks helped translate innovation across contexts—connecting faculty, instructional designers, and administrators in ways that allowed ideas to travel and adapt (Gunder & Shellgren, 2022; Hoyte et al., 2010; Tharapos & O'Connell, 2022). These networks created pathways for alignment, enabling strategy to be shaped by those closest to the learning environment.

While Wenger's community of practice framework provides one scaffold for understanding this AI usage for pedagogical practices, the WCET Policy and Practice Framework (2023) provides a broader look at a culture of AI usage that looks at governance and operations. The UT San Antonio–SWUT collaboration led to future conversations with institutional leaders from across the globe on how AI was part of a larger ecosystem of learning extending outside of the classroom, and in doing so, better prepared students for global career engagement. Leadership capacity and foresight was strengthened through reflective dialogue and joint sensemaking. Operational coherence was enhanced by surfacing inconsistencies across policy and practice through shared examples from diverse regional contexts. And ethical stewardship was embedded by foregrounding student perspectives and faculty agency.

Together, these frameworks, along with the case example of UT San Antonio's engagement in global conversations around AI strategy, help reveal how communities of practice can evolve into systems of strategic coherence. When sustained over time, with trust and shared values at the center, CoPs become more than professional development tools. They function as distributed nervous systems for institutional change—responsive, flexible, and capable of carrying insight across boundaries. These

networks are not defined by scale or formal structure. What makes them durable is the quality of the relationships they hold. They are maintained through ongoing interaction, reciprocal learning, and a shared belief in the importance of collective experimentation. As institutions face increasingly complex decisions about the role of AI in teaching, governance, and strategy, the UT San Antonio example offers a glimpse of what becomes possible when collaboration is treated not as a tactic, but as a foundational condition for transformation.

CULTURE, CREATIVITY, AND CO-LEADERSHIP

The rapid evolution of AI has prompted institutions to consider not only how learning is assessed or how content is created, but also how culture is shaped (McIntosh, 2024). Beneath the headlines and hype cycles, deeper questions have emerged about the kinds of values, identities, and capacities that academic communities want to foster in the age of AI. These are not technical questions alone—they are questions of creativity, trust, power, and leadership.

Rather than viewing AI through the narrow lens of automation or risk, a growing number of institutions are using the moment to spark a broader cultural renaissance. They are exploring how AI might serve as a catalyst for reimagining the creative possibilities of education—not just in what students produce, but in how institutions design their systems, policies, and learning environments. In this framing, creativity becomes a strategic imperative. It is not reserved for isolated disciplines or capstone projects but embedded into the structures and processes that shape institutional life. This requires a shift in how leadership itself is understood. Traditional models, centered on hierarchy and authority, are often too slow and siloed to respond to the complexity of AI. What's needed instead are distributed leadership models that make space for co-facilitation, shared authorship, and networked forms of decision-making. These models do not flatten accountability, but rather reorient it—inviting diverse voices into the process of shaping academic futures, and recognizing that the people closest to the work are often best positioned to guide its evolution.

At UT San Antonio and other institutions engaged in global conversations about AI and academic innovation, these shifts are already underway. Creative literacies are being recognized not only as essential competencies for students, but as strategic assets for institutional leaders. This includes the ability to imagine multiple futures, remix and translate knowledge across domains, and design environments that are inclusive, adaptive, and generative. These literacies are not simply about using tools—they are about developing a digital mindset, and learn to ask the right questions, make smart decisions and appreciate new possibilities for a digital future (Neely & Leonardi, 2022). Leaders who adopt these approaches will be able to develop their organization's talent to prepare their company for successful and continued digital transformation. Furthermore, the development of creative literacies prepares learners for their future careers by imbuing them with a more resilient and innovative mindset.

Inviting New Voices to the Leadership Table

One of the most significant shifts in this emerging culture of academic innovation is the recognition that leadership is no longer the domain of a select few. Students, staff, faculty, and administrators all bring critical perspectives to the table. When institutions treat students only as recipients of strategy—rather than as co-authors—they miss vital insights into how policy is experienced, where gaps exist, and how future-facing systems can be built with equity and agency in mind.

Increasingly, institutions are rethinking how students can participate in strategic conversations. This includes student involvement in task forces, advisory councils, pilot programs, and even policy development and review. But participation alone is not sufficient. What matters is how those contributions are received and incorporated. Institutions must model a culture in which listening is as valued as leadership, and where co-creation is not just welcomed but expected. This shift is also visible in how faculty and staff are engaged. Rather than assigning AI integration to a single department or role, institutions are experimenting with collaborative models that allow ideas to surface laterally. In doing so, they tap into the collective intelligence of the community and build solutions that are more sustainable, inclusive, and aligned with institutional values.

The metaphor of the institution as both architect and artist is useful here. As architects, leaders must ensure that policies are structurally sound, that strategies are aligned, and that systems function coherently. But as artists, they must also attend to nuance, creativity, and the affective dimensions of learning and change. AI strategy, when approached this way, becomes an opportunity not only to design better infrastructure, but to imagine better possibilities.

Trust, Vulnerability, and the Design of Culture

At the heart of these transformations is the role of trust. Institutions that are successfully navigating AI integration often share a common cultural characteristic: they model vulnerability at every level. Leaders acknowledge uncertainty, invite dissent, and resist the pressure to present polished answers before the community has had a chance to contribute. This orientation creates psychological safety—a prerequisite for experimentation and shared risk-taking (Gunder et al., 2024).

One way this shows up in practice is through the flattened hierarchy approach adopted by several academic innovation offices. Rather than assuming that leadership comes only from above, these models recognize that culture is shaped in every corner of the institution. The role of leadership, then, becomes one of space-making—creating the conditions for others to lead, and valuing contributions that may otherwise go unseen. This includes student interns surfacing ethical concerns, early-career faculty experimenting with new assignment models, and staff noticing gaps in communication and support structures. These distributed models of leadership do not eliminate the need for clear direction or coordination. Instead, they emphasize shared authorship over control. Strategy is developed through iteration, not decree. Conversations about AI are grounded in real work—course design, advising, student support, policy review—and informed by the lived experiences of those navigating the day-to-day realities of academic life.

Creative leadership in this context is not about individual charisma or innovation theatre. It is about building cultures in which imagination and inclusion are foundational, not optional. These are cultures in which people feel empowered to ask difficult questions, take meaningful risks, and co-create solutions that reflect the complexity of the moment. AI is not the centre of this work, but it has become a catalyst for surfacing deeper conversations about identity, ethics, purpose, and possibility. This is particularly true in global partnerships, where institutions are grappling with how to reconcile local values with international expectations, and how to learn from peers navigating similar challenges in different contexts. These dialogues offer a powerful reminder that no institution has all the answers—and that learning in public, with humility and curiosity, is a strength rather than a liability.

As institutions look to the future, the imperative is not just to adapt to AI, but to design systems and cultures that prepare learners for the interconnected, AI-informed world they will inherit. This includes

preparing students to work across differences, engage with ambiguity, and contribute meaningfully to communities that are increasingly shaped by technological mediation. It also includes ensuring that institutional strategies reflect the diverse lived experiences of students, faculty, and staff—and that policies are responsive not just to risk, but to possibility. The work of academic innovation, in this framing, is both technical and cultural. It requires attention to systems, tools, and policies—but also to stories, relationships, and values. It invites institutions to lead not by control, but by co-creation. And it positions creativity not as a luxury, but as a critical skill for building resilient, inclusive, and adaptive learning environments. In this way, the conversation about AI becomes something more than a question of compliance or efficiency. It becomes a question of what kind of world we are preparing students to shape—and how our institutions can model the kind of leadership, collaboration, and imagination that world will require.

OPERATIONAL RECIPROCITY AND STRATEGIC REFLECTION

Many global partnerships begin with a moment of shared recognition—a signal that another institution is navigating similar terrain with shared values. For the collaboration between UT San Antonio and SWUT, that signal came through their mutual designation as Adobe Creative Campuses. While this affiliation initially reflected a joint commitment to digital creativity and media fluency, it quickly became a bridge for deeper institutional dialogue. The designation offered more than a symbolic connection; it marked a shared investment in creativity as a leadership strategy and a pedagogical imperative.

Adobe played a catalytic role in expanding this initial connection into a broader conversation. As the partnership between UT San Antonio and SWUT gained traction, Adobe helped convene delegations of institutional leaders, expanding the dialogue to include universities across Australia, France, and Japan. These exchanges moved beyond virtual meetings, creating opportunities for in-person visits and immersive discussion. The transition from Zoom to site visits brought a new dimension to the collaboration, enabling leaders to step into each other's ecosystems and engage with context, nuance, and process in ways that remote dialogue could not replicate.

What emerged was a transnational learning community centered not on product adoption, but on institutional culture. Rather than benchmarking for the sake of competition, these universities began sharing the how of their strategies—approval loops, faculty messaging, policy drafts, and leadership alignment—illuminating the internal workings that shape the external experience of innovation. This transparency opened the door to reciprocal learning across layers of institutional practice.

Learning Through Transparency of Process

In the earliest stages of this collaboration, the institutions involved made a deliberate choice to exchange more than surface-level insights. They shared the practical realities of their internal operations: how policies were developed and reviewed, how communications were sequenced and tested, how decisions moved across cabinet, academic affairs, and student engagement teams. In many cases, these workflows had never been fully articulated, even within an institution. But in preparing to share with others, leaders found themselves naming and refining their internal practices in new ways.

One university rethought its messaging about generative AI use in classrooms after seeing how another emphasized student agency and invited faculty experimentation. Another reconsidered how it

convened faculty development cohorts after learning about a partner's co-facilitation model across instructional design and academic departments. Still another adjusted its AI steering committee structure to include student affairs and library staff after hearing how peer institutions were surfacing student concerns and information ethics in their planning.

These weren't moments of replication. They were moments of recognition. Seeing another institution's approach created space for reflection: not because one version was superior, but because it revealed what had previously gone unexamined. Sometimes this surfaced gaps in perspective or raised overlooked considerations. Other times it highlighted organizational strengths that had gone unnamed but were worth cultivating further. This openness around process helped cultivate a culture of mutualism rather than mimicry. Institutions could see how local constraints—such as state policy, budget timelines, or staffing models—shaped different routes to similar values. Sharing in-progress drafts, facilitation outlines, and internal planning timelines became a form of rehearsal for strategic choices not yet finalized. This kind of transparency allowed participants to spot points of tension, refine decisions in advance, and strengthen internal coherence without waiting for post-mortem analysis.

Global Mirroring and Strategic Realignment

This model of institutional reciprocity—what might be called global mirroring—offered more than peer benchmarking. It created opportunities for reflection that would have been difficult to achieve in isolation. By engaging with others who were navigating similar questions, institutions could interrogate their own assumptions and priorities. What one institution emphasized as a leadership opportunity, another framed as a student success risk. What one saw as a curricular gap, another interpreted as a research opportunity. These moments often helped uncover misalignments between institutional goals and day-to-day implementation. For example, an institution that had framed its AI strategy as student-centered realized, through peer exchange, that its policy review process had not yet included student representation. Another noticed that its communications emphasized academic integrity concerns but lacked a parallel message of empowerment or guidance. The act of sharing with peers prompted internal reflection and realignment, surfacing nuances that may have remained obscured without the external lens.

In this global exchange, institutions found themselves practicing multiple dimensions of AI leadership, strategy, operations, and innovation simultaneously. Leadership alignment was tested and strengthened through cross-role dialogue. Cultural capacity expanded as institutions exchanged stories and strategies. Operational coherence was enhanced through shared templates, feedback loops, and role mapping. And ethical stewardship was deepened through shared attention to student data, agency, and inclusion. Peer engagement created not only a mirror but also a map—one that helped participants better locate themselves within the larger terrain of digital transformation. The value was not just in comparison but in calibration. Each institution could better understand its posture, priorities, and opportunities by seeing them refracted through the lived experiences of others.

Peer Exchange as Strategic Rehearsal

These collaborative spaces became, in effect, a form of strategic rehearsal. Institutions could test emerging ideas, receive formative feedback, and anticipate friction points in advance of full-scale implementation. This made peer dialogue not just informative, but strategic. Leaders weren't only sharing what had happened—they were shaping what could happen next. This rehearsal extended

across policy decisions, communication plans, professional development initiatives, and even technology procurement. In one case, an institution was able to reframe its internal AI advisory group mandate based on feedback about how others were navigating governance concerns. In another, hearing how a partner organized its curriculum mapping process helped clarify the scope and stakeholder list for an upcoming instructional design sprint. These weren't wholesale adoptions; they were iterative calibrations informed by trusted insight.

Crucially, this work happened in a climate of trust. Institutions did not posture for prestige or protect information as proprietary. They acted on the belief that sharing strategy, in-process and incomplete, was not a liability but a contribution. And they recognized that in a moment of rapid technological and social change, the best insights often come not from those who have all the answers—but from those willing to work through the questions in community. In this way, the global Adobe Creative Campus relationship evolved from an affiliation into a learning architecture. It became a distributed knowledge system—a dynamic, responsive infrastructure through which strategy could move laterally, adapt iteratively, and grow in fidelity to institutional values.

As more institutions seek to respond to the challenges and opportunities posed by AI, these forms of operational reciprocity and strategic reflection will become essential. They model a shift from competitive benchmarking to collective capacity-building. And they reaffirm that the future of academic innovation is not only a matter of insight, but of relationship. When institutions see each other not as rivals but as collaborators, the possibilities for shared learning and transformation multiply.

A BLUEPRINT FOR ADAPTIVE, VALUES-BASED INNOVATION NETWORKS

Across the initiatives described in this paper, a consistent theme emerges: meaningful academic innovation rarely begins with the adoption of new technologies. Instead, it emerges through deliberate investment in relationships, values, and institutional culture. As institutions across the globe contend with the evolving implications of AI, it becomes increasingly evident that successful transformation is less a matter of technical capacity and more a function of cultural coherence, collective agency, and shared expertise.

Innovation, in this framing, is not characterized by sudden or large-scale change. Rather, it unfolds incrementally through sustained reflection, shared inquiry, and reciprocal exchange. Institutions that cultivate these conditions—those that prioritize dialogue over prescription and alignment over acceleration—are often best positioned to respond to uncertainty and complexity. Global partnerships rooted in mutuality and shared values provide a foundation for this kind of adaptive work, offering a vision of change that is scalable, ethical, and grounded in context.

Flexible Frameworks and Coalition Culture

Conventional approaches to institutional change often rely on static frameworks, assuming that once established, they will guide future decision-making effectively. However, as the rapid evolution of AI tools and educational technologies demonstrates, fixed structures quickly become outdated. In contrast, adaptive innovation networks operate with frameworks that are intentionally provisional—designed not for control, but for responsiveness. These structures support co-creation, iteration, and localized adaptation while maintaining coherence across broader strategic aims.

Such flexibility is not merely tactical. It reflects a deeper shift in institutional posture: from focusing on tool adoption and compliance to cultivating a culture of shared authorship and reflection. The collaborations described here exemplify this shift. Advisory structures evolved over time rather than being fixed at the outset. Pilot programs were used not only to test new technologies, but also to interrogate core assumptions and surface latent tensions. Reflection was treated as a continuous process rather than a concluding activity. And significantly, the development of policies was used sparingly, if at all, and replaced by clear guidelines and “policies in pencil” to enable a more responsive structured support to faculty and students.

This cultural orientation aligns closely with the notion of coalition culture—a set of practices and values that prioritize relational trust, iterative learning, and distributed leadership. Within such coalitions, institutions share emerging strategies not as finalized models, but as generative possibilities. The aim is not replication, but inspiration. By focusing on ethos rather than prescription, coalition culture enables a form of distributed innovation that is both scalable and sustainable.

Designing For Ethical Pluralism and Contextual Sensitivity

As higher education institutions engage in global dialogue around AI, one of the most pressing challenges they face is navigating ethical complexity across diverse contexts. Legal frameworks, regulatory environments, and cultural norms vary widely across regions, shaping what is permissible, expected, and aspirational in the design of AI-informed educational systems. Rather than treating these differences as obstacles, the global partnerships examined here embraced them as essential design conditions. Ethical pluralism—the recognition that ethical principles may be interpreted differently depending on cultural, institutional, and societal contexts—was not merely acknowledged, but operationalized. Participants engaged in sustained dialogue to surface assumptions, question dominant narratives, and identify points of alignment without collapsing difference.

The WCET Policy and Practice Framework (2023), with its focus on leadership alignment, cultural capacity, operational coherence, and ethical stewardship, also offered a useful scaffold for understanding how institutions enacted this work in practice. Within the global collaborations described, these dimensions were not addressed sequentially, but concurrently and iteratively. Trust-building, policy development, and strategy formation were embedded within reciprocal learning, informed by diverse institutional and regional contexts.

Ultimately, this approach required a form of ethical humility. Institutions avoided prescriptive approaches that assumed universality, opting instead to elevate local expertise and lived experience. This orientation fostered inclusive governance structures that invited participation from students, staff, and leaders across domains. Notably, student voice was positioned not as a check-box consultation but as a critical perspective in shaping AI strategy. Crucially, these partnerships rejected the notion of universal solutions. AI strategy was not treated as a matter of importing best practices, but of cultivating contextually grounded frameworks rooted in shared values. This stance allowed institutions to remain responsive to regulatory shifts, cultural expectations, and emergent technologies without sacrificing coherence or accountability.

Toward A Remixable Blueprint

What emerges from this living case example is not a prescriptive model, but a blueprint that is intentionally flexible—designed to be remixed, reimaged, and adapted to new contexts. It is a

conceptual framing defined not by specific tools or timelines, but by a set of design cues that can guide institutions as they build their own values-based innovation ecosystems.

Among these guiding principles:

- **Begin with shared values, not shared technologies.** Alignment grows from collective purpose rather than uniform adoption.
- **Design with flexibility.** Create frameworks that support adaptation, reflection, and iterative development.
- **Attend to cultural responsiveness.** Ensure that local context informs implementation while sustaining broader strategic integrity.
- **Practice ethical humility.** Recognize the limits of one's own institutional perspective and actively seek pluralistic dialogue.
- **Cultivate coalition culture.** Prioritize relationships, shared authorship, and mutual accountability across roles and borders.

These cues are not intended to dictate practice. Rather, they offer a vocabulary and structure for institutions seeking to engage in adaptive, inclusive innovation. They highlight a shift from pipelines to ecosystems, from competition to collaboration, and from short-term outcomes to long-term capacity-building.

In an era marked by rapid technological advancement and shifting societal expectations, the capacity to adapt with integrity is paramount. Innovation networks that center values, relationships, and reflection are uniquely positioned to meet this challenge. They model how institutions can not only respond to change but help shape it—co-creating futures that are more just, more inclusive, and more connected. As higher education continues to grapple with the implications of AI, this blueprint offers a way forward. It invites institutions to move beyond technical adoption toward cultural transformation. And it reminds us that the most enduring innovations are those that are co-authored, contextually grounded, and guided by shared commitments to educational purpose and social responsibility.

CONCLUSION: LEADING WITH CONNECTION

As the role of AI in higher education continues to expand, so too does the need for thoughtful, relational, and values-aligned leadership. The case presented here is not simply a narrative of how a group of institutions are exploring AI together. It is a portrait of what becomes possible when institutions prioritize collaboration, trust, and shared purpose as the foundation for innovation. What began as a dialogue around pedagogical strategy evolved into a global network of reflection, experimentation, and co-leadership—offering a living example of how academic innovation can be designed with integrity and adaptability at its core.

This approach reimagines strategy as a process of connection rather than control. Rather than treating policy as the primary lever for institutional change, the collaborations described here treat process and practices as guided by a deeper cultural commitment to institutional values and mission. Trust-building, transparency, and shared inquiry are positioned not as soft skills or supplementary activities, but as essential infrastructure for navigating uncertainty. In doing so, this model challenges dominant assumptions about what academic leadership looks like in an age of complexity. It frames leadership

as participatory, responsive, and imaginative—less about asserting authority, and more about enabling collective capacity.

Institutions that work this way are not simply deploying new tools. They are cultivating new ecosystems. They operate more like living systems than machines—shaped by feedback loops, sustained by interdependence, and capable of adapting to emerging needs without losing sight of shared values. Their resilience comes not from rigid protocols, but from the depth of their relationships and the clarity of their purpose. This kind of cultural infrastructure is not only vital for AI strategy. It is essential for any form of institutional innovation that seeks to be inclusive, ethical, and transformative.

Indeed, while this paper has focused on AI as the focal point for collaboration, the underlying model is broadly applicable. Whether designing new modalities of learning, expanding open education, rethinking student support, or aligning institutional priorities with global challenges, the principles outlined here hold. Academic innovation, at its best, is not about novelty for its own sake. It is about designing futures that are more responsive, more accessible, and more human. This is not simply a strategic opportunity. It is an ethical imperative.

What the UT San Antonio-led collaboration illustrates is that global partnerships can serve as mirrors, maps, and engines for that imperative. They help surface tensions, clarify values, and rehearse new forms of academic leadership. But more than that, they invite institutions to imagine themselves differently—not as isolated entities or service providers, but as nodes in a dynamic ecosystem of shared learning and collective responsibility.

In this moment of rapid transformation, the path forward is not to lead with policy alone. It is to lead with connection—with a commitment to deep listening, mutual accountability, and ongoing reflection. It is to lead with curiosity, approaching change not as a threat but as an invitation to learn and evolve together. And it is to lead with collective purpose, recognizing that the most enduring innovations are co-authored, relationally sustained, and grounded in a shared vision of what higher education can—and must—become.

AUTHOR NOTES

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AI Usage Statement

Given the rapid evolution of generative AI practices, the authors affirm the importance of openness and transparency in disclosing AI use within academic work. Such statements not only support trust and accountability, but also contribute to the collective exchange of practice, enabling continued reflection on the role and positionality of AI in scholarly contexts.

In this project, generative AI was employed for specific, bounded tasks within the research process. AI-supported search tools—Elicit and Semantic Scholar—were used to assist in identifying initial articles for consideration in the literature review. Zoom’s native transcription tool and Descript AI were used to generate transcripts of Zoom interviews. ChatGPT Plus was used to produce summaries of author reflections as a point of comparison to the human-coded data summaries completed by the authors. Generative AI was not used in drafting the manuscript.

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Beyond Prediction: Leveraging Storytelling to Reimagine the Future of Learning

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ABSTRACT

This concept paper advances a model in which storytelling functions as an act of hope and defiance to reimagine the futures of education. Positioned beyond prediction and trend extrapolation, storytelling is framed as a core methodology for cultivating futures literacies—the capacity to anticipate, envision, and act upon multiple possible futures. Through the integration of theoretical perspectives, practical applications, and diverse experiential insights, the paper examines how storytelling extends institutional imagination, fosters curiosity as an enduring cultural practice, and enables a broad range of stakeholders—including students—to serve as co-authors of long-horizon visions. The analysis is anchored in the case of the 100 Year Ed Tech Project (2025), a scenario sprint initiative that convened cross-sector participants to envision education in 2075 and identify actionable pathways from those futures to the present. This case demonstrates how narrative-based futures methodologies can bridge the gap between aspirational vision and strategic practice, generating outcomes that are both innovative and implementable. Inclusive facilitation strategies, backcasting processes, and attention to relational and emotional dimensions are highlighted as essential design elements. The paper concludes by outlining the implications of this model for educational strategy, governance, and policy. When embedded as a sustained cultural capacity, storytelling enables educational systems to navigate uncertainty with integrity, resist deterministic narratives of decline, and actively shape the horizon. This approach positions storytelling as a strategic asset for constructing educational futures that are equitable, resilient, and collectively imagined.

Keywords

futures literacies; storytelling; education technology; backwards design; learning futures; curiosity; participatory design

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INTRODUCTION—FROM PREDICTION TO PARTICIPATION: FUTURES LITERACIES AS A COLLECTIVE IMPERATIVE

Educational systems worldwide are navigating a period of unprecedented complexity, shaped by the convergence of technological innovation, ecological crisis, geopolitical instability, and profound social transformation (OECD, n.d.; UNESCO, 2025; World Economic Forum, 2023). In this context, the prevailing discourse on the “future of education” often gravitates toward prediction—analyzing trends, developing forecasts, and generating ranked projections of what is most likely to occur. Yet such predictive approaches, while valuable for understanding probabilities, risk narrowing the field of vision to what is already legible and measurable. They can inadvertently constrain institutional imagination, foreclose transformative possibilities, and perpetuate the very inequities they aim to address.

This paper advances the premise that the future is not an inevitability to be forecast, but a terrain to be shaped. Long-horizon strategic design—tethered to a sequence of generative actions that link present commitments to aspirational futures—offers a more participatory and empowering alternative to prediction alone. At the center of this shift is the practice of futures literacies: the capabilities, dispositions, and sensibilities that enable individuals and communities to imagine, critically interrogate, and actively co-create multiple possible futures (Horst & Gladwin, 2022). Futures literacies extend beyond the technical skill of reading signals and trends. They cultivate a dynamic orientation to uncertainty, one grounded in anticipation, adaptation, and agency (Gladwin et al., 2022). Importantly, these literacies are not the sole province of futurists, researchers, or senior leaders. They are inherently distributed—emerging across roles, disciplines, and communities. Students, faculty, administrators, policymakers, industry partners, and community members each hold distinct vantage points, histories, and aspirations that enrich the collective capacity to act in the present toward more generative futures (Gladwin et al. 2022). As the authors have reflected in their own practice, foresight work that excludes these diverse perspectives risks producing impoverished visions—futures that are less inclusive, less resilient, and that fail to ensure ethical and impactful support for all learners.

Curiosity as a mindset (our attitudes) and a skillset (our actions) is central to this enterprise. As both a disposition and a practice, curiosity fuels the willingness to explore the unfamiliar, interrogate entrenched assumptions, and hold space for multiple, even contradictory, possibilities. It resists the closure that prediction often imposes; instead of narrowing the horizon to what is most probable, curiosity expands the field to encompass what is possible, plausible, and presently unimaginable. The authors’ reflections consistently emphasize curiosity as a driver of creativity and as a safeguard against complacency, framing it as both a methodological stance in foresight work and an ethical commitment to the communities such work serves.

Storytelling occupies a vital role in cultivating these literacies. At its most powerful, storytelling is not merely descriptive; it is generative (Gunder & Buckner, 2023). It renders possible worlds visible, relatable, and debatable. Narratives of the future can serve as acts of hope, articulating aspirational visions that galvanize collective effort. They can also function as acts of defiance, challenging the

fatalism of dystopian trajectories and mobilizing communities to prevent harmful futures from materializing. By framing the present as a threshold between multiple potential futures, storytelling equips participants to navigate not only what might happen, but what should happen—and how they might work together to realize those outcomes (Boje, 2011).

In this sense, storytelling and futures literacies are mutually reinforcing. Futures literacies offer the cognitive and ethical scaffolding to imagine beyond the present, while storytelling provides the narrative and emotional infrastructure to make those futures tangible, relatable and actionable. The authors' experiences facilitating cross-sector foresight exercises through their design and development of the 100 Year EdTech project (The 100 Year EdTech Project, 2023) reinforce this interplay: when participants were invited to write letters from the future, to imagine the daily lives of learners in 2075, or to construct scenarios of both flourishing and crisis, they not only expanded their conceptual horizons but also identified near-term actions that could move their institutions toward their preferred futures. For the many participants of this event that was first established in 2023, the invitation to imagine education 50 years into the future felt both thrilling and transgressive. Rarely are educators afforded the time, space, or cultural permission to dream at such a scale—especially in public, across roles, and in community. The act of stepping outside of institutional constraints into expansive futures was not simply conceptual; it was emotional. Joy, urgency, grief, and wonder coexisted in the space, creating for many of the participants a reconnection to purpose. In this way, the practice of futures literacies became an act of both professional renewal and collective liberation.

The turn toward futures literacies also requires reframing participation in educational foresight. Too often, strategic planning is conducted within narrow decision-making circles, with limited space for students, early-career professionals, or community members whose lived experiences are directly shaped by institutional policy. In contrast, the authors' collective practice centers the belief that the work of shaping educational futures must be democratized. Including a wide range of voices does not simply improve the representativeness of scenarios; it fundamentally enriches the substance of the futures imagined and strengthens the relational networks needed to enact them.

This paper proposes a conceptual model for integrating storytelling into futures literacies practice in education. Drawing on the authors' autoethnographic reflections on their design and facilitation of the 100 Year EdTech Project, as well as literature on foresight, narrative, and educational change, it examines how stories can:

- expand the horizon of possibility;
- surface underlying values and assumptions; and
- mobilize action toward more inclusive, imaginative, and actionable futures.

The argument unfolds in four movements. First, we examine the conceptual terrain of futures literacies, situating it within scholarly traditions and identifying its distinctive contributions to educational foresight. Second, we explore the methodological role of storytelling, highlighting its dual capacity to inspire hopeful action and resist harmful inevitabilities. Third, we share insights from the authors' collaborative practice that illustrate how diverse roles and lived experiences shape the futures we envision. Finally, we offer design considerations for embedding storytelling into educational foresight processes, with the aim of fostering more equitable and generative pathways from the present to the future.

In reframing futures work from prediction to participation, we underscore a central proposition: the future is not something to be anticipated; it is something to be authored. Storytelling, when embedded in the practice of futures literacies, becomes one of the most potent tools for shaping that authorship collectively. It invites us to imagine a new reality for learning, to resist resignation in the face of seemingly insurmountable challenges, and to design educational systems capable of navigating—and even flourishing within—the complexities ahead.

FROM CAMPFIRES TO COSMIC TIMELINES: STORYTELLING AS EDUCATIONAL FORESIGHT

Storytelling is one of humanity's oldest and most enduring forms of collective meaning making (Bietti et al., 2018). Long before the emergence of written language, humans gathered around fires, in ceremonial spaces, and in public forums to exchange stories that transmitted knowledge, reinforced values, and wove collective memory across generations (Webster, 2006; Yoder-Wise & Kowalski, 2003). The metaphor of moving “from campfires to cosmic timelines” captures the expanded scope of storytelling in educational foresight. Around the campfire, stories connect us to one another in the intimacy of shared experience; on the cosmic timeline, stories position those experiences within the vast arc of planetary and intergenerational change. Futures literacies require both: the grounding of the local and the expansive vision of the long-term (Horst & Gladwin, 2022). By integrating storytelling into the practice of educational foresight, institutions can hold both scales at once—designing actions that are meaningful in the near term while aligning them with the aspirations and responsibilities of the long term. In doing so, they not only prepare for the future; they participate in authoring it.

Across cultures, narrative has served as a vessel for identity, a mechanism for transmitting moral and practical wisdom, and a means of envisioning the worlds to come (Webster, 2006; Marshall et al., 2023). In Indigenous epistemologies such as those articulated in Māori thought, concepts like *whakapapa* (genealogy) (Barlow, 1994), *moemoeā* (visionary dreaming) (Potiki, 2023), and *te ao hurihuri* (the ever-turning world) (Kake, 2019) embed futures within relational and intergenerational continuities rather than isolating them as detached projections. The stories told in such contexts are not ornamental to the work of the future—they are the work of the future.

In the context of educational foresight, storytelling operates as both a cultural inheritance and a methodological tool. Where conventional strategic planning often privileges linear projections based on historical data, storytelling accommodates complexity and uncertainty (Talgorn & Hendriks, 2021). It creates a shared narrative space in which diverse perspectives can be articulated, compared, and integrated. This is particularly crucial for futures literacies, which depend on the capacity to imagine beyond the most probable scenarios and into realms of the possible, plausible, and as-yet-unimaginable (Boje, 2011; Boje et al., 2004).

The scholarly literature on foresight reinforces this view. Inayatullah's causal layered analysis framework (2004), for example, explicitly identifies narrative as a critical layer in futures thinking—one that shapes, and is shaped by, deeper worldviews and societal myths. Narratives are not neutral; they carry embedded values, assumptions, and visions of what constitutes progress or decline. The stories we tell about the future influence the actions we take in the present, shaping trajectories over time in ways that technical forecasting alone cannot achieve.

The authors' collective experiences reflect these dynamics in practice. In cross-sector futures workshops, storytelling often emerged as a cognitive infrastructure that could hold complexity while aligning diverse stakeholders around shared purposes. One scenario sprint invited participants to envision education as "our most regenerative force for planetary healing." The narrative arcs that emerged were not uniform: some centered on deep integration of ecological stewardship into curriculum, while others imagined new governance models grounded in reciprocity and interdependence. What united them was the way each story provided an anchoring vision—an imaginative north star—from which backcasting exercises could identify concrete actions to be taken today.

Acts of Hope and Acts of Defiance

Storytelling in educational foresight has a dual capacity: it can serve as an act of hope, articulating aspirational futures that galvanize collective effort, and as an act of defiance, resisting the inevitability of harmful trajectories. Acts of hope focus attention on what could flourish—systems of learning that are equitable, adaptive, and oriented toward the wellbeing of people and planet. Acts of defiance, by contrast, confront dystopian possibilities head-on, mobilizing communities to prevent such futures from taking hold.

In the authors' experience, both modalities are necessary. During one facilitated exercise, participants constructed scenarios of education in a "post-truth" world, where contested epistemologies and the erosion of shared facts posed existential threats to democratic life. For some, the act of narrating such a scenario felt destabilizing. Yet it also provoked urgent conversations about civic literacies, critical pedagogy, and the ethical use of AI—conversations that might not have emerged without the catalytic discomfort of imagining the worst. Hope and defiance thus operate in tandem: hope inspires movement toward preferred futures, while defiance sharpens the vigilance needed to avoid undesired ones.

Strategic Rehearsal and Ethical Mirrors

Beyond inspiration or warning, storytelling functions as a mode of strategic rehearsal. By placing institutions within richly imagined future contexts, narratives allow leaders, educators, and learners to "practice" decision-making under conditions they have not yet encountered. These rehearsals reveal both the robustness and the fragility of current strategies. They also create opportunities to identify new pathways for adaptation.

In scenario-building, utopian and dystopian visions serve as ethical mirrors, reflecting back the implications of our design choices. A utopian future where learning is a planetary birthright may prompt questions about how to safeguard access and equity at scale. A dystopian future dominated by extractive data economies forces consideration of how to embed privacy, autonomy, and consent into educational technologies. In each case, the narrative frame enables stakeholders to test their values under imagined conditions of both flourishing and crisis. The authors have found that such exercises work best when they are rooted in human experience. Asking participants to write a "day in the life" of a learner in 2075, for example, prompts attention to the social, emotional, and material conditions of learning—what a learner carries, where they learn, how they know they belong. This grounding in lived experience produces futures that are more than conceptual blueprints; they are inhabitable worlds.

Storytelling As a Curiosity Engine

Curiosity is the connective tissue between storytelling and futures literacies. Storytelling invites participants to ask, “What if?” and “Who else?”—questions that expand the scope of possibility and bring marginalized perspectives into the frame. In the authors’ workshops, prompts that combined radical possibility with grounded human detail were the most generative. One such prompt asked: “What if credentialing were continuous and communal, embedded in life stages and social contribution rather than age or seat time?” The stories that followed spanned contexts from community-based micro-credential networks to intergenerational mentorship models embedded in public spaces.

By structuring narrative prompts to cultivate curiosity, facilitators can help participants resist the pull toward default assumptions. This is critical for futures literacies, which require sustained engagement with uncertainty rather than premature closure (Gladwin et al., 2022). In many cases, the act of telling a story together led participants to identify questions they had never before considered—about who holds authority in knowledge systems, how learning spaces are governed, and what forms of value education should produce.

Cross-Cultural Grounding and Pluralism

Storytelling also provides a bridge between culturally distinct ways of knowing. In the authors’ reflections, Māori epistemologies (Kake, 2019) emerged as illustrative of how futures work can be anchored in relational and intergenerational continuities rather than detached forecasts. These concepts underscore that futures are not speculative abstractions, but living extensions of past and present relationships, accountable to both ancestry and descendants.

Designing for pluralism in storytelling means creating conditions where no single perspective dominates and where participation reflects genuine co-authorship (Gladwin et al., 2022). As the authors note, equitable storytelling practices avoid treating any group as a subject to be spoken about; instead, they invite all participants to act as co-creators, contributing from their own funds of knowledge (Moll et al., 1992). This involves structuring opportunities for multiple voices to speak with each other, rather than to or over each other, and ensuring that stories reflect a plurality of experiences and worldviews. By embedding these principles into the design of foresight activities, storytelling becomes not just a tool for envisioning futures, but a practice of shared authorship and mutual recognition, a universally human action that serves as a familiar space for learning from our past to define the future we want to see.

ARCHITECTURES OF IMAGINATION: FRAMEWORKS, PROPOSITIONS, AND METAPHORS FOR LONG-HORIZON DESIGN

Conceptualizing storytelling as a method for educational foresight requires engaging with the frameworks, propositions, and metaphors that link narrative practice to strategic design. Across the literature in futures studies, educational change, and narrative inquiry, three functions of storytelling emerge as particularly salient for long-horizon thinking: speculative projection, exploration of possibility extremes, and cognitive reframing through defamiliarization. These functions are not mutually exclusive; they often overlap and reinforce each other, particularly when integrated into structured foresight processes.

Speculative Projection

Speculative projection uses narrative to imagine how trends might evolve, what novel dynamics might emerge, and what developments are currently beyond the scope of existing models (Gümüşay & Reinecke, 2024). This approach pushes participants to extend beyond forecasting the “most likely” future and to construct scenarios that stretch the boundaries of plausibility. In practice, speculative projection can begin with small shifts—a change in assessment policy, the introduction of a new technology, the reconfiguration of a community space—and trace their potential long-term consequences. The authors’ experiences in the 100 Year Ed Tech Project illustrate how speculative prompts can surface entirely new problem spaces. In one scenario sprint, participants envisioned “multi-species learning partnerships” where human, ecological, and artificial intelligences collaborated on shared challenges. The narrative was less a prediction than a provocation, designed to open conversation about the ethics, epistemologies, and infrastructures that such partnerships would require.

Poles of Possibility

The second function, exploring poles of possibility, invites participants to develop utopian and dystopian endpoints and to use these extremes as ethical mirrors. Utopian narratives clarify the values and aspirations that should guide decision-making; dystopian narratives expose the risks, trade-offs, and unintended consequences that might otherwise remain invisible. The authors have found that alternating between these poles fosters a more comprehensive strategic conversation. For example, in the scenario *The Neverending Classroom* (The 100 Year EdTech Project, 2025), participants imagined a future of continuous upskilling that initially appeared empowering but, when examined critically, revealed pressures around pace, exhaustion, and inequity. This exploration prompted discussion about the conditions under which lifelong learning can genuinely serve human flourishing rather than becoming a mechanism of overwork and exclusion.

Defamiliarization

The third function, cognitive reframing through defamiliarization, begins with the familiar and then introduces a radical shift that destabilizes assumptions and expands the problem space (Tian et al., 2024). This begins with an environment that participants believe they understand—such as a library or a classroom—and altering one fundamental condition to force rethinking. For example, imagining a library relocated to a floodplain due to climate change requires reconsidering the role, design, and governance of that institution. Defamiliarization interrupts habitual thinking, making space for new patterns of inquiry and design to emerge.

Integration With Foresight Methodologies

These narrative functions align with established foresight methodologies, including Inayatullah’s causal layered analysis (2004), which links visible trends to underlying worldviews and myths, and with backward design, which begins from a desired outcome and maps backwards to the present (Wiggings & McTighe, 2005). In educational contexts, integrating narrative functions into these methods can deepen both the imaginative and analytical dimensions of foresight. A speculative scenario can be deconstructed through causal layered analysis to reveal the cultural narratives and systemic assumptions it encodes. A utopian endpoint can be reverse-engineered through backward design to generate actionable near-term strategies.

Inclusion By Design

An architecture of imagination is only as strong as its inclusivity. Equitable participation requires intentional design choices to ensure that a range of voices can contribute and be heard. The authors' practice has demonstrated several effective strategies, including providing multiple modes of engagement (visual, oral, textual) to accommodate different abilities, learning preferences, and communication styles. The scenario building also emphasized plural authorship, where participants avoided the framing of any groups as passive subjects, but rather engaging all as co-creators contributing from their own funds of knowledge (Moll et al. 1992). The authors collectively emphasize that equitable storytelling is achieved when multiple voices are speaking with each other, rather than to or over each other, and when stories reflect a genuine plurality of experiences and worldviews. Embedding such practices into the design of foresight activities ensures that the resulting narratives are not only imaginative but also representative of the diverse communities they aim to serve.

From Framework to Practice

The integration of these functions, methodologies, metaphors, and inclusion principles creates what the authors call “architectures of imagination.” These architectures do more than generate visions of the future; they create the structural conditions for those visions to be acted upon. By deliberately combining speculative projection, poles of possibility, and defamiliarization with foresight tools like causal layered analysis and backward design, and by embedding them in inclusive design, institutions can transform storytelling from an ancillary activity into a core strategic process. When implemented in this way, narrative foresight becomes both a shared imaginative endeavor and a mechanism for collective agency. It is not simply about producing a set of scenarios, but about cultivating the capacity—distributed across roles, disciplines, and sectors—to continually author and re-author the futures of education in response to evolving challenges and opportunities.

STORYTELLING IN ACTION—A CASE EXAMPLE OF THE 100 YEAR ED TECH PROJECT

The 100 Year EdTech Project emerged from a shared desire to reframe educational technology as a cultural and societal force rather than a purely technical field (The 100 Year EdTech Project, 2023). Designed as a multi-day, cross-sector convening, the project invited participants to imagine the role of educational technology in the year 2075—and then to bring those visions back into the present. Rather than relying solely on panels or keynotes, the event centered on structured storytelling as its primary mode of inquiry and synthesis. Storytelling was not only a medium for sharing ideas but a catalyst for generating, refining, and connecting them. The design was intentionally disruptive to default conference formats. Participants—spanning higher education leaders, K–12 educators, technologists, students, industry partners, community organizers, and artists—were asked to suspend conventional boundaries of their work (Gonick, 2023). From the outset, the invitation framed the work as an act of collective authorship where participants would write the next century of educational technology together.

Scenario Sprint Methodology

The methodology for the event drew from design sprint practices—a highly focused, time-bound process for developing richly imagined, values-driven futures (Banfield et al., 2015). The sprints included different narrative practices for developing group solutions to selected challenges:

- **Context Setting:** Participants were introduced to key signals and trends, with provocations curated to disrupt linear thinking. These prompts emphasized climate futures, geopolitical shifts, technological evolution, demographic change, and emergent pedagogies.
- **Divergence and Convergence:** Groups explored scenarios without self-editing. Facilitators encouraged “plausible impossibilities” as a way to push beyond incrementalism. Attention was placed on narrative coherence, embedded values, and implications for equity, agency, and resilience.
- **Backward design:** Each group identified the milestones, decisions, and actions required to bridge their imagined future to the present moment.

In terms of the participants, the plurality of roles represented was no accident. Care was taken to ensure diversity across role, discipline, geography, and lived experience. In each group, a senior administrator might sit alongside an undergraduate student, a librarian next to an AI developer, an industry leader beside an instructional designer. This structural inclusion meant that ideas were immediately interrogated from multiple vantage points and that power was distributed more evenly (Gonick, 2023).

Facilitation design balanced rigor with play. Both digital and analog resources helped participants move beyond verbal brainstorming into more sensory forms of ideation. Time was deliberately structured for cross-pollination between groups—interstitial moments for “story exchanges” where scenarios in progress were shared, critiqued, and remixed both synchronously and asynchronously (often via shared Google Docs).

Scenario Examples

By the end of the sprints, dozens of scenarios were developed, each capturing a unique intersection of aspiration and challenge. These scenarios were documented in an open publication that the core planning team made available to the field as a blueprint for future action across local and global contexts. Four of the dozens of scenarios (The 100 Year EdTech Project, 2025) generated by the community are presented below, illustrating the range and richness of the work:

- **Students Declaring World Challenges Instead of Majors:** In this future, higher education organizes itself around solving complex global problems—such as water scarcity, refugee resettlement, or digital sovereignty—rather than around disciplines. Learners declare a challenge to which they commit their study, drawing on faculty, community, and peer expertise from multiple fields. Degrees are portfolios of contributions to that challenge rather than checklists of required courses.
- **Nomadic, Climate-Adaptive Libraries:** As climate instability displaces communities, libraries transform into mobile, modular hubs. These “knowledge caravans” follow population shifts, providing learning resources, connectivity, and cultural continuity. They are designed to be co-owned by the communities they serve, and their collections evolve based on local needs and languages.

- **Multi-Species Learning Partnerships:** Education expands beyond the human domain, recognizing the intelligence and agency of other species. From ecological stewardship projects co-designed with migratory bird researchers, to AI-assisted interpretation of dolphin communication, learning is a shared, cross-species endeavor. The premise is not symbolic but reciprocal—humans learn from and with non-human partners in service of mutual survival.
- **Teaching in a Post-Truth World:** In an era where information is both abundant and contested, the core aim of education shifts to cultivating discernment, empathy, and ethical reasoning. Pedagogies emphasize critical media literacy, cross-cultural dialogue, and the co-creation of trustworthy knowledge ecosystems. Instructors function as facilitators of sense-making rather than sole arbiters of truth.

While speculative, each scenario was tethered to observable trends and grounded in participants' professional and personal expertise. They were both aspirational and diagnostic—illuminating what might be possible and what must be addressed now to move in that direction.

Backward Design as a Bridge

Backward design served as a pivot point between vision and practice. By working backward from their imagined futures, participants identified a sequence of actions that could be initiated immediately. In the “Students Declaring World Challenges” scenario, for example, the backward design process surfaced actions like piloting interdisciplinary challenge-based capstones, developing microcredential pathways linked to global goals, and rethinking advising structures to support non-linear learning trajectories.

For the “Nomadic Libraries” scenario, backcasting revealed the need for scalable digital collections, modular infrastructure design templates, and cross-sector agreements for resource sharing in times of crisis. Importantly, these near-term actions often built on existing initiatives, reframing them as stepping stones toward more ambitious long-term transformations.

The bridge-building aspect of backward design was both strategic and motivational. Participants reported that the process prevented futures thinking from feeling like escapism—it became a concrete tool for deciding what to prioritize in the present.

Relational and Emotional Dimensions

Beyond the formal outputs, the 100 Year EdTech Project demonstrated the emotional power of storytelling as a collective practice. Envisioning 2075 together cultivated a sense of shared purpose that transcended institutional boundaries. Participants described feeling “reconnected to why I entered education in the first place” and “hopeful in a way I haven’t felt in years.”

Storytelling also functioned as a relational equalizer. The shared act of imagining dissolved hierarchies—senior leaders listened intently to student provocations, educators of different contexts helped their colleagues to reframe their assumptions, and faculty members deferred to community organizers on questions of cultural stewardship. The process modeled the very collaborative dispositions that the scenarios themselves called for.

Crucially, the stories did not shy away from difficulty. Grappling with post-truth politics, climate migration, and species extinction required emotional labor. Facilitators made space for grief and

uncertainty alongside excitement and optimism. This openness deepened trust and allowed hope to emerge as something earned, not imposed.

Insights From Participant Experience

The 100 Year EdTech Project generated a set of insights that speak to the transformative potential of storytelling as a futures practice. Participants reported that engaging in speculative scenario creation challenged deeply held assumptions, prompting them to reconsider the nature of collaboration, knowledge, and institutional purpose. Encounters with perspectives outside their usual professional circles frequently served as turning points—moments when a provocative idea reframed an entire line of thinking.

The presence of learners as equal contributors proved especially catalytic. Their contributions, unconstrained by legacy structures, often introduced novel metaphors and design concepts that expanded the scope of the group’s imagination. One scenario was notably shaped by the idea of “memory gardens” that combine ecological restoration with archival preservation, reframing the library not only as a repository of knowledge but as a living participant in environmental stewardship.

A recurring pattern across the event was the shift from skepticism to engagement. Some participants entered doubtful about the value of long-horizon thinking, only to find that the backward design process anchored visionary scenarios in concrete, near-term strategies. This linkage between imagination and implementation dissolved the perceived gap between “dreaming” and “doing,” instilling a shared sense that futures are made through deliberate, collective action.

These experiences demonstrate that futures storytelling is not solely about the narratives it produces, but also about the dispositions and capacities it builds. By fostering openness to unfamiliar perspectives, elevating contributions across roles, and creating actionable pathways from visionary scenarios, the process cultivated a durable sense of agency and hope—qualities essential for navigating and shaping uncertain educational futures.

Toward Generative Action

Taken together, the 100 Year EdTech Project demonstrates how long-horizon storytelling can operate as both an imaginative and an actionable practice. The scenario sprint methodology provides a replicable framework, but it is the intentional mix of participants, the embedded inclusion mechanisms, and the attention to relational and emotional dynamics that make the work transformative. By integrating backward design, the event ensured that the energy generated by storytelling flowed directly into strategies for change. By weaving in diverse voices—through co-author reflections and participant exchanges—it captured the multiplicity of perspectives required for futures that are both visionary and viable. Most importantly, it positioned the act of imagining not as a retreat from present challenges but as a way of confronting them with renewed clarity and collective will. The result is a model for futures work that moves fluidly from vision to practice, inspiring immediate action without losing sight of the long arc of possibility.

SHAPING THE HORIZON: IMPLICATIONS FOR EDUCATIONAL SYSTEMS AND STRATEGY

The conceptual model advanced in this paper positions storytelling not as a peripheral communication tool, but as a central mechanism for cultivating futures literacies—the capacity to anticipate, imagine, and act upon multiple possible futures. Futures literacies move beyond the descriptive stance of futures thinking by engaging the imagination as a site of agency and by encouraging active experimentation with alternative possibilities (Gladwin et al., 2022). Within educational systems, cultivating these literacies at all levels—from students to senior leaders—reshapes the way institutions orient themselves toward the future.

When storytelling is embedded as a sustained practice, it disrupts linear, deficit-driven narratives about change and instead frames adaptation as an iterative, participatory process (Gunder & Shellgren, 2022). The ability to tell, share, and evolve multiple future stories equips institutions to engage with uncertainty in generative ways, making them less vulnerable to reactive, short-term responses (Boje, 2011; Juelskjær, 2014).

Strategic Alignment and Long-Horizon Design

The integration of storytelling into strategic planning enables institutions to align long-term visions with short-term priorities. Traditional planning often defaults to extrapolating from present conditions, limiting the scope of change to what is currently visible. Story-based scenario work shifts this dynamic by allowing stakeholders to rehearse decisions in the context of radically different conditions—economic, environmental, cultural, or technological (Gunder & Shellgren, 2022). For example, a scenario envisioning nomadic, climate-adaptive learning hubs forces a reconsideration of infrastructure investment, content delivery models, and community partnerships. Strategic decisions made under this frame are informed not only by current market data, but by an awareness of long-horizon challenges and opportunities. The act of situating present decisions within a tapestry of possible futures increases institutional resilience, ensuring that strategies remain adaptable as conditions evolve.

The Role of Curiosity in Systemic Innovation

Curiosity is both a value and a practice in the proposed model. As a value, it affirms that questioning, exploring, and seeking out differences are integral to the health of educational systems. As a practice, it requires structures that reward inquiry rather than premature closure, creating conditions for diverse perspectives to enter the conversation. Institutional cultures that prioritize curiosity are more likely to invest in experimentation, accept provisional solutions, and tolerate the ambiguity inherent in transformative change. Storytelling supports this culture by making curiosity tangible—through narratives that invite “what if” thinking, and through scenarios that open up rather than foreclose possibilities. In this sense, curiosity is not incidental to futures literacies; it is the sustaining force that keeps them alive over time.

Diverse Roles as Co-Creators of Futures

A recurring lesson from the case study is that systemic foresight is most robust when it is co-authored by people across a spectrum of roles and experiences. Including students, community partners, and non-academic voices is not simply an act of representation; it materially alters the range of ideas and

strategies that emerge. In strategic terms, this means designing governance and planning processes that make space for these voices from the outset, not as token consultations at the end. Scenario sprints, visioning workshops, and other narrative-based foresight activities can be integrated into annual planning cycles, accreditation processes, or program review structures, ensuring that the co-creation of futures is institutionalized rather than ad hoc.

Acts Of Hope and Defiance as Strategic Drivers

Hope, in the context of educational futures, is not a passive state but an active stance. It is expressed through commitments to equity, sustainability, and community well-being that endure even when prevailing trends suggest otherwise. Defiance operates alongside hope as the refusal to accept deterministic narratives of decline, disruption, or inevitability. In practice, acts of hope and defiance manifest in strategic choices: maintaining funding for community outreach programs during austerity periods, investing in climate resilience despite short-term financial pressures, or protecting academic freedom in the face of political constraint. By embedding storytelling processes that surface and validate these commitments, institutions are better able to align their operational decisions with their deeply held values. The process of collaborative storytelling through acts of hope and defiance often felt, to the authors, like lighting candles in an uncertain night—small acts of collective vision that resisted the pull of resignation. Rather than forecasting from darkness, participants authored toward light, using narrative to carve out spaces of clarity, care, and possibility.

Policy and Governance Implications

Embedding storytelling into educational systems has implications for governance and policy at multiple levels. At the institutional level, this might involve revising strategic frameworks to include scenario-based exploration as a regular feature of decision-making. At the system or governmental level, it could take the form of policy mandates for stakeholder-inclusive foresight exercises in higher education planning cycles. Storytelling methodologies also offer a way to translate complex policy decisions into accessible, human-centered narratives that build public understanding and support (Gunder & Shellgren, 2022). This narrative transparency is particularly important in contexts where trust in institutions is low; stories can bridge the gap between technical policy language and the lived experiences of those affected (Boje, 2011).

Sustainability and Capacity Building

For storytelling to become a durable part of educational strategy, capacity must be built across the system. This involves training facilitators who can guide futures-oriented storytelling, developing repositories of open scenarios and prompts, and creating cross-institutional networks for sharing practice. Sustained investment in this capacity ensures that the work does not depend on a small number of champions, but becomes embedded in the institutional fabric. Metrics for assessing the impact of storytelling in strategy may also need to evolve. Instead of measuring only outputs (e.g., the number of scenarios produced), evaluation could focus on changes in decision-making quality, diversity of stakeholder input, and the adaptability of strategies over time.

Building a Culture of Futures Literacies

Ultimately, the goal is to cultivate a culture in which futures literacies are not confined to special initiatives but inform the everyday practices of teaching, learning, and leadership. Storytelling provides the connective tissue for this culture, linking strategic vision to classroom pedagogy, policy

development to community engagement, and institutional resilience to collective imagination. When this culture is in place, educational systems are better able to navigate uncertainty with integrity and creativity. They are not merely reacting to external pressures but actively shaping the horizon in ways that reflect their values and aspirations. In such a context, the act of telling a story about the future becomes an act of world-making—one that invites participation, fosters agency, and continually renews the possibility of better educational futures.

CONCLUSION: BEYOND PREDICTION, TOWARD POSSIBILITY

The argument advanced in this paper begins with a simple but urgent premise: the futures of education are not fixed. They are imagined, contested, and made through the choices we make in the present. Storytelling, when integrated as a deliberate and sustained practice, offers a way to both expand and discipline our collective imagination. It enables institutions and communities to surface values, test ideas, and align action with long-horizon aspirations. By framing futures work through storytelling, we move beyond the limits of prediction and trend analysis. The approach cultivates futures literacies—the capacity to anticipate and shape multiple possible futures—while also embedding curiosity as an enduring cultural practice. These literacies are not reserved for specialists; they flourish when students, educators, leaders, and community members act as co-authors of the narratives that will guide decision-making.

Acts of hope and defiance are not abstractions in this model. They take form in strategic choices, policy commitments, and everyday practices that refuse the inevitability of inequity, exclusion, or decline. In telling different stories about the future, we give ourselves permission to defy the narrow constraints of the present, while also building the scaffolds that make alternative futures actionable.

The case of the 100 Year EdTech Project demonstrates how storytelling methodologies can bridge the gap between vision and practice. Scenario sprints, backcasting, and inclusive design structures not only generate compelling narratives but also equip participants with the strategies, relationships, and confidence to carry those narratives forward. The impact is both conceptual and material: it shifts institutional orientation, reconfigures priorities, and sustains momentum in the face of uncertainty.

If educational systems are to thrive amid accelerating change, they must invest not only in new tools and policies but also in the cultural capacities that make transformation possible. Storytelling is one such capacity. It connects the granular decisions of today with the expansive possibilities of tomorrow, and in doing so, it transforms the work of planning from an exercise in forecasting to an act of collective world-making. When educational leaders, students, technologists, and artists gather to write futures together, something shifts—not just in thought, but in being. Shoulders drop. Eyes brighten. People speak in metaphors, laugh easily, linger over phrases that name what has never been spoken aloud. In this space, strategy is humanized. It is here, in the charged atmosphere of shared imagination, that transformation takes root—not as policy, but as promise.

The future of learning will not be given to us; it will be authored—draft by draft, story by story, action by action. The invitation, then, is clear: to tell the futures we most need, to listen deeply to those who tell them alongside us, and to act together in ways that make those futures real.

AUTHOR NOTES

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AI Usage Statement

Given the rapid evolution of generative AI practices, the authors affirm the importance of openness and transparency in disclosing AI use within academic work. Such statements not only support trust and accountability, but also contribute to the collective exchange of practice, enabling continued reflection on the role and positionality of AI in scholarly contexts.

In this project, generative AI was employed for specific, bounded tasks within the research process. AI-supported search tools—Elicit and Semantic Scholar—were used to assist in identifying initial articles for consideration in the literature review. Zoom’s native transcription tool and Descript AI were used to generate transcripts of Zoom interviews. ChatGPT Plus was used to produce summaries of author reflections as a point of comparison to the human-coded data summaries completed by the authors. Generative AI was not used in drafting the manuscript.

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Academic Innovation in Practice: Strategies for Transforming Institutional Culture

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ABSTRACT

Amid increased attention to academic innovation in higher education, institutions are grappling with how to sustain transformative practices beyond isolated pilots or leadership initiatives. This concept paper reconceptualizes academic innovation as a cultural practice—one grounded not in discrete outputs, but in the values, relationships, and routines that shape institutional life. Using a qualitative approach grounded in portraiture methodology (Lawrence-Lightfoot & Davis, 1997), and building on findings from a commissioned study by the National Academies of Sciences, Engineering, and Medicine (Vito et al., 2025), the paper introduces a three-part framework for culture-building: collaboration (who we work with and how we work together), creation (what we design, iterate, and imagine), and connection (how we foster trust, belonging, and long-term impact) (Gunder, 2023). Across these dimensions, the paper highlights institutional design principles for cultivating innovation that is inclusive, adaptive, and sustained. Recommendations are offered for leaders, educators, and staff seeking to embed innovation within the structures and systems of their institutions—not as episodic change, but as an enduring cultural commitment.

Keywords

academic innovation; opened culture; institutional transformation; higher education strategy; collaboration; creative literacies; connection; curiosity

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INTRODUCTION

In an era defined by rapid digital transformation, widening opportunity gaps, and evolving learner needs, “academic innovation” has become a fixture in higher education discourse. Yet despite its growing ubiquity, the term often obscures more than it reveals. In some institutions, innovation is treated as a strategic imperative. In others, it surfaces only through ad hoc experiments, grant-funded pilots, or the enthusiasm of individuals working in the margins. Across these settings, the rhetoric of innovation is frequently entangled in cycles of hype, fatigue, and inconsistency. And while foundational work to codify and classify job titles and organizational units as a gesture toward innovation (Bishop and Keehn, 2015), there is a critical need to extend this inquiry toward capturing the depth and diversity of the work taking place beneath the surface—often unrecognized, sometimes unsanctioned, and almost always undercelebrated.

This concept paper argues that academic innovation is best understood not as a title, tactic, or time-bound initiative, but as a cultural phenomenon—a way of being that reshapes how institutions think, act, and connect. To ground this reframing, we begin with the foundational work of cultural theorist Stuart Hall, who defined culture as “the practice of giving meaning to people, objects and events” (Hall, 1997). Drawing on this definition, and expanding upon it through the fieldwork and scholarship of Opened Culture, we offer a remix grounded in three interdependent elements that animate academic innovation as culture: collaboration (how we work together), creation (what we build), and connection (how we serve and engage others) (Gunder, 2023).

This triadic framework surfaces not just who drives innovation, but how it takes root. While some may hold formal roles with “innovation” in the title, countless educators, staff, and students contribute to innovation in invisible, grassroots ways—building new programs, designing inclusive learning experiences, launching pilots, and fostering communities of practice with limited recognition or support. These efforts are not peripheral to academic innovation; they are its very fabric. Past attempts to standardize or title the work have often flattened its complexity, failing to honour the vibrant tapestry of values, practices, and perspectives that constitute a true culture of innovation.

In this paper, we explore how institutions can recognize, cultivate, and sustain academic innovation as a cultural force. We draw on findings from a commissioned research study for the National Academies of Sciences, Engineering, and Medicine (Vito et al., 2025)—expanded through multimodal portraits, interviews, and lived experiences from institutions across diverse contexts. We organize our analysis through the three cultural dimensions: collaboration (people), creation (objects), and connection (events). Through these lenses, we present real-world strategies, mindset shifts, and cultural practices that enable innovation to flourish—not as a product, but as a practice.

COLLABORATION AS CULTURE: DESIGNING WITH PEOPLE

Academic innovation cannot thrive in isolation. It is built—sometimes slowly, sometimes messily—through relationships. Among the three dimensions of academic innovation culture that this paper explores, collaboration is the *people* dimension: it defines who we work with, how we show up together, and how trust and meaning are built across differences (Gunder, 2025). While often invoked as a value or competency, collaboration is more than a practice—it is a culture unto itself, one that must be actively designed, resourced, and sustained.

Across higher education, the term *collaboration* is frequently overused and underdefined. In some contexts, it serves as a placeholder for consensus or compliance. In others, it describes moments of transactional teamwork rather than sustained co-authorship. True collaboration—the kind that transforms institutions—requires psychological safety, mutual accountability, and a shared sense of purpose. And yet, in many academic settings, collaboration is hindered by siloed structures, uneven power dynamics, lack of recognition, and fatigue from performative inclusion. These gaps not only erode trust but stall innovation before it begins.

This section explores how academic innovation can flourish when collaboration is practiced as a cultural orientation rather than a tactical step. Through institutional portraits and leadership reflections, we illustrate how intentional design of relationships, rituals, and mindsets allows collaboration to move from ideal to infrastructure.

Cultivating the Conditions for Collaboration

Academic innovation rooted in collaboration begins with a shared belief: that no single actor can transform education alone. Effective institutions build distributed networks of co-designers—faculty, staff, students, and administrators—who generate solutions together across disciplines and hierarchies. These networks are most powerful when collaborators are not only included but invested, with the time, trust, and tools needed to act meaningfully.

Among the institutions and leaders contributing to this work, collaboration was not left to chance. Teams developed daily 15-minute stand-up meetings to maintain alignment and momentum. Others co-created project charters, visual planning tools, and shared vocabularies that served as scaffolds for open communication and joint ownership. These small but intentional practices helped ensure that collaboration was not just a value—but a visible, repeatable structure embedded in everyday work.

Collaboration also demands emotional labor—especially the courage to ask questions without having all the answers. The institutional leaders in this study emphasized the importance of psychological safety as a condition for innovation. Colleagues needed to feel it was safe to express uncertainty, propose new ideas, or challenge the status quo. Cultural rituals like “yes, and” framing, open feedback loops, and assumptions of positive intent helped reinforce that safety. Leaders also emphasized humour and vulnerability as strategies for maintaining momentum during ambiguity or change.

Expanding Who Counts as a Collaborator

Collaboration in academic innovation expands when institutions recognize leadership in all its forms—including from students (Bishop & Boughman, 2019). A compelling example emerged in a faculty-student partnership program focused on artificial intelligence. In this initiative, students were not passive participants but co-designers and facilitators, shaping curricula, leading workshops, and driving strategy. Their involvement deepened faculty learning and created more responsive, future-facing approaches to teaching and learning (Vito et al., 2025). This shift from student consultation to student co-authorship reflected a deeper cultural reorientation—one that centered mutual respect, shared power, and collaborative growth.

A second strategy involved counter-narrative inquiry—subtle leadership techniques used to question prevailing assumptions without provoking defensiveness. Rather than challenge ideas directly, leaders would ask: “What would that look like if we did it differently?” or “Where have you seen that succeed?”

These moments invited critical reflection while preserving trust, creating space for generative tension and new approaches. As Vito et al. (2025) noted, the ability to lean into complexity with curiosity is a hallmark of mature collaborative culture.

Finally, successful institutions leaned on coalitions of the willing—passionate faculty and staff who prototyped ideas, refined them through peer feedback, and catalyzed larger change. These grassroots contributors often operated without formal authority, but their credibility, commitment, and creativity carried real influence. Institutions that intentionally recognized and amplified these efforts—through microgrants, showcases, and shared authorship—were more likely to scale innovation sustainably (Vito et al., 2025).

From Performance to Practice

Despite good intentions, collaboration can falter when it becomes performative. Contributors to this study described the frustration of being brought into conversations after key decisions had already been made. They also highlighted the burden of constant collaboration without sufficient time, compensation, or decision-making power. To move beyond performance, institutions must embed collaboration structurally and engage people meaningfully from the start. This includes creating space for shared governance, budgeting time for design and iteration, and compensating contributors for their labour.

In sum, collaboration in academic innovation is about more than teamwork. It is about working together differently—with humility, trust, and a commitment to shared transformation. When designed with care, collaborative cultures generate not only better programs, but better questions, deeper alignment, and stronger institutional resilience. As institutions look to scale academic innovation, they must ask not only what to build, but who they are building with, and whether those collaborators feel seen, heard, and empowered to lead.

CREATION AS CULTURE: DESIGNING WITH PURPOSE

Creation is often the most visible expression of academic innovation. It lives in the programs we launch, the platforms we pilot, the learning experiences we reimagine, and the strategies we co-write (Hobson & Landman, 2024). But to see creation only as a product is to miss the deeper cultural work. Creation is also a way of thinking, sensing, and responding—a dynamic process through which values are enacted, meaning is made, and institutions evolve.

As one of the three cultural dimensions explored in this paper, creation represents the *objects* of academic innovation—though those objects are not always tangible. They may be tools or technologies, but just as often they are policies, practices, processes, or spaces. In every case, they are cultural expressions: evidence of what an institution is willing to invest in, interrogate, and imagine.

Artifacts, Iteration, and the Power of Process

Creation was frequently reflected in visible artifacts—curriculum maps, resource playbooks, new course models, professional development frameworks, and AI-integrated teaching practices. Yet these outputs were never endpoints. Instead, they served as markers in an ongoing cycle of iterative development—often supported by pilot phases, feedback loops, and reflective rituals that helped teams adapt in real time.

This culture of “failing forward” was a defining feature of creative academic innovation. Rather than striving for perfection, institutions intentionally structured their efforts around learning-in-action. Design sprints, collaborative debriefs, and storytelling sessions were often used to share not only successes but also missteps—helping to normalize experimentation and working towards an uncertain outcome, deepening collective insight in the process.

This approach was further supported through platform-level collaborations, such as co-developing features with vendor partners or testing new tools through cross-institutional alliances. These relationships became extensions of the creative ecosystem—shaping how new innovations were conceived, integrated, and refined. Agility on both sides was key, especially when adapting systems like learning platforms to accommodate emergent practices such as AI literacy development or student-led initiatives.

The AI Student Partner Program: Creating Through Trust

One particularly powerful example of collaborative creation was the development of an AI Student Partner Program. Rather than limiting student involvement to feedback or pilot testing, this initiative embedded students as full co-designers—leading faculty workshops, shaping institutional strategy, and contributing to artifacts like curriculum guides, session resources, and shared language for responsible AI use.

The success of this program stemmed not just from its outputs, but from its underlying values. It modelled a culture of mutual trust and creative reciprocity, in which students, faculty, and staff worked together across differences and expertise. The program surfaced new approaches to teaching, challenged assumptions about technological fluency, and redefined student roles in institutional decision-making.

This work also illustrates how creation can be a site of identity and power negotiation. Students moved from passive recipients to cultural stewards—showing that the act of creating together can rewire traditional hierarchies and cultivate long-term investment in institutional innovation.

Scaffolding Creation Through Design Practice

Sustained creation doesn’t emerge by accident. Institutions often developed intentional scaffolds to support it—mechanisms that nurtured iteration, reflection, and connection across projects. These included:

- Design cycles for testing and refining ideas through structured phases
- Story-sharing as a practice of surfacing lived experience and communal learning
- Visual frameworks and charters to establish shared expectations and goals
- Flexible strategic plans framed as “living documents” that could evolve alongside insight

Strategic planning, in particular, was treated as a creative act rather than a compliance exercise. Rather than dictating static roadmaps, planning processes were designed to be collaborative, reflective, and adaptive. In one example, teams deliberately wove storytelling and metaphor into planning conversations, using narrative to build shared understanding across silos and invite bold thinking. These practices positioned strategy itself as a cultural artifact—one that could evolve as the institution learned and changed. These approaches align with frameworks such as design thinking, which emphasizes iterative, human-centered development [insert citation]; Doug Belshaw’s (2014) creative

digital literacies, which underscore playfulness, experimentation, and risk in digital spaces; and emerging models of creative AI literacies, which emphasize co-creation with AI to extend agency and cultural relevance (Gunder et al., 2024). By anchoring innovation in creative processes rather than prescriptive checklists, institutions created space for emergence, adaptability, and alignment with human values.

Designing With Purpose

Ultimately, creation in academic innovation is not just about producing content or implementing tools. It is about designing with purpose—embedding curiosity, responsiveness, and shared values into everything we build. It invites institutions to hold space for plurality and respectful criticality, questioning long-standing practices not out of cynicism, but from a belief that better is possible.

When creation is treated as a cultural process, institutions are no longer chasing the next shiny object. They are cultivating conditions for collective authorship, where creativity becomes a shared responsibility and a shared right. The most powerful innovations are not just new—they are deeply resonant, because they emerge from a culture that knows how to listen, reflect, and reimagine.

CONNECTION AS CULTURE: DESIGNING FOR IMPACT

If collaboration represents who we work with, and creation represents what we make together, then connection represents why it matters. Connection is the lifeblood of academic innovation: the relational threads that bind people to one another, to their institutions, and to the larger purposes of education. Without it, even the most elegant innovations risk becoming hollow or unsustainable. When connection is strong, by contrast, innovation lives on in communities long after leaders graduate, transition, or take on new roles.

Connection is not built through a single initiative or platform. It emerges over time through resonance, trust, and shared purpose—qualities that cannot be mandated but can be cultivated. This is why connection is often the distinguishing factor between innovation that spreads and innovation that fades. When communities feel genuinely included, heard, and served, they are more likely to sustain the work, build on it, and carry it forward.

Relational Scaling Through Story and Belonging

One of the most important dimensions of connection is its role in scaling change. While institutional scaling is often imagined procedurally—expanding a pilot or replicating a framework—the most sustainable forms of scale are relational. They emerge from networks of trust that grow outward, creating new spaces for participation and co-authorship.

Several institutions cultivated this kind of scale by embedding storytelling and public celebration into their innovation cycles. Faculty and staff hosted “roadshow” sessions across departments to showcase new practices, gather feedback, and seed alignment. Student-facing events offered opportunities for learners to share their experiences with new tools or models. These events weren’t just promotional—they were rituals of belonging that built shared meaning across roles and silos.

In one example, students who had helped co-create an AI-supported learning resource were invited to present alongside instructional designers during a campus-wide teaching showcase. Their joint storytelling allowed faculty and peers to see not only what was made, but how it was made, and why

it mattered. In another instance, innovation leaders launched a community “impact gallery” featuring stories, visuals, and audio clips curated by staff and students involved in the work. These public acts of storytelling turned internal initiatives into shared narratives—catalyzing broader engagement and amplifying the impact of early adopters.

Trust, Transparency, and Cultural Resonance

Genuine connection also requires transparency and care. In several institutional examples, project leaders prioritized candid communication around expectations, uncertainty, and shifting priorities. Rather than presenting initiatives as fully formed, they invited others into the process—offering “works in progress” for feedback and openly discussing constraints and dilemmas.

This vulnerability wasn’t seen as a weakness, but as a foundation for trust. Participants across roles reported that they were more willing to contribute, experiment, and even fail when they understood the bigger picture and felt that their input mattered. Innovation efforts were thus framed not as top-down directives, but as shared problem-solving rooted in a collective desire to improve the student experience.

This kind of openness also extended to the design of platforms and systems. Teams responsible for learning technologies regularly conducted empathy interviews or listening sessions with faculty and students before implementing new tools. These conversations not only informed feature choices and training plans, but also surfaced relational insights—what people needed to feel supported, understood, and aligned with institutional direction. In some cases, these conversations led to slower rollout timelines or additional scaffolds, demonstrating that speed was not valued over trust.

This attention to context also extended to how innovation efforts were framed and introduced. The most successful initiatives reflected local language, values, and lived experience. In these cases, innovation was not imported but grown—aligned with the rhythms and needs of the community. Connection, then, becomes a measure of “culture add” and fairness: it reflects whether communities feel seen, heard, and served, and whether new practices enhance, rather than homogenize, the institutional fabric.

Students as Partners in Culture-Building

Connection is perhaps most essential in how institutions engage students—not just as users or recipients, but as cultural contributors. Student-centered design becomes more powerful when it fosters a sense of belonging, identity, and co-ownership.

Several institutions created programs where students played visible and substantive roles in academic innovation. Student partners facilitated workshops for faculty on using generative AI tools in the classroom, offering real-world use cases, guardrails, and ethical considerations. Others supported strategic planning sessions or built microsites to house community-sourced resources and examples.

These roles did more than improve outcomes; they helped students feel aligned with institutional mission and values. Students expressed pride in seeing their contributions recognized and validated, and they reported a stronger sense of institutional affinity—even describing themselves as ambassadors or stewards of a shared culture. This kind of relational alignment deepens loyalty, fosters trust, and turns short-term engagement into long-term investment (Vito et al., 2025).

Connection Through Systems, Structures, and Context

Beyond relationships, connection is also shaped by the systems and environments in which innovation happens. Digital platforms—whether learning management systems, dashboards, or communication tools—function as cultural infrastructure. When thoughtfully designed and contextually grounded, they extend human connection, making innovation work more visible and accessible.

In one institutional case, a learning platform was adapted to include faculty- and student-facing “innovation snapshots”—short profiles of ongoing projects, complete with opportunities to join or contribute. These snapshots created a rhythm of visibility, enabling asynchronous participation while reinforcing a sense of shared purpose.

However, connection can quickly fracture when these systems are implemented without attention to context. Participants noted that tools rolled out without local translation—such as unexplained terminology, inflexible workflows, or inaccessible interfaces—eroded trust and made people feel excluded. To address this, several teams created support structures like multilingual guides, peer-led training sessions, and “tech mentors” embedded within departments.

These choices reflect a broader commitment to contextual relevance, which is a core condition of connection. Innovation cannot resonate unless it meets people where they are—culturally, linguistically, and structurally. Designing for connection thus requires institutions to move beyond universal solutions and toward flexible, inclusive practices that honour difference and complexity.

Designing For Enduring Impact

To design for connection is to design for impact. Connection is what allows innovation to move beyond isolated wins and become part of an institution’s living culture. It is what sustains momentum during leadership transitions, policy shifts, or external shocks. And it is what enables people—students, faculty, staff, and community members—to see themselves as co-creators of that culture.

Connection takes time, transparency, and tenderness. It is not a technical achievement, but a cultural commitment. It is nurtured through storytelling, shared decision-making, mutual care, and celebration. And when it is present, it turns innovation from a product into a practice—and from a moment into a movement.

INSTITUTIONALIZING A CULTURE OF INNOVATION

Culture is not what we declare—it’s what we do consistently. The values of an institution are embedded not in its mission statements, but in the behaviours it rewards, the rituals it repeats, and the systems it sustains. To truly institutionalize a culture of innovation, leaders must look beyond individual projects or personalities and intentionally design the routines, practices, and infrastructures that make experimentation feel normal and worthwhile.

In academic settings, this means moving beyond innovation as a special initiative and embedding it into the daily life of the institution. When innovation becomes a shared cultural expectation rather than an isolated act of heroism, it begins to scale, stick, and evolve.

From Exception to Expectation: Normalizing Innovation

One of the most powerful levers for institutionalizing innovation is repetition. Innovation becomes cultural when it shows up not only in large projects but in the small, habitual practices that shape the everyday. When staff and faculty regularly engage in reflective practice, attend idea-sharing sessions, or iterate on course design, they reinforce a norm of continuous learning and adaptation.

Several institutions established faculty innovation grants to encourage experimentation. These micro-funding opportunities allowed instructors to test new tools, reframe assignments, or develop interdisciplinary collaborations. Grantees were asked to present their work at campus showcases or in short video features, which helped socialize new ideas and celebrate risk-taking.

Others formalized faculty and staff “champion networks”, drawing on peer influence to spread innovative practices and provide informal coaching. These champions helped normalize conversations about generative AI, equity-centered design, and learner engagement strategies. Crucially, these networks were not positioned as elite circles but as open, supportive communities where participants could test ideas and learn together.

By making innovation public, repeatable, and peer-supported, institutions created cultural muscle memory that made change feel more familiar—and more possible.

Leadership as Culture Work

Leadership plays a critical role in shaping environments where innovation can thrive—not through control or charisma, but through consistent modelling, trust-building, and value-centered action. In institutions where academic innovation has taken root, leaders have focused less on commanding change and more on cultivating the cultural conditions that make change possible.

Across institutional contexts, innovation-supportive leadership behaviours emphasized visibility, humility, and shared ownership. Rather than issuing directives, leaders regularly hosted open conversations, invited feedback, and remained accessible during change processes. They made time to co-facilitate workshops, attend student presentations, or participate in idea-generation sessions alongside faculty and staff. These actions signalled that innovation was not a side project or a marketing slogan—it was a shared practice that everyone, including leadership, was accountable for.

In these environments, innovation was not framed as something one had to seek permission for. Instead, the cultural tone normalized experimentation, reframing setbacks as learning moments and successes as collective wins. Leaders encouraged risk-taking not just through words, but by consistently responding with curiosity and care when things didn’t go as planned. This created a psychological safety net in which people felt empowered to try new approaches without fear of blame or dismissal.

Another pattern across institutions was the commitment to designing with, not for. Innovation leaders didn’t position themselves as solution providers—they positioned themselves as co-learners and facilitators. Strategic priorities were shaped through co-authorship with frontline practitioners and students, resulting in initiatives that reflected real needs and lived experience rather than assumptions. This participatory ethos was especially important in navigating complex or politically sensitive changes, where shared understanding and trust made adaptation possible.

Ultimately, leadership that sustains a culture of innovation is not defined by hierarchical power but by cultural fluency. These leaders understood that shaping culture requires patience, presence, and a deep commitment to modelling the behaviours they hoped to see repeated. By treating culture work as a continuous and participatory process, they helped embed innovation into the everyday life of the institution.

Infrastructure That Empowers, Not Encloses

Institutionalizing innovation does not mean imposing rigid structures. In fact, over-engineering systems can stifle creativity and sap momentum and lead to mediocrity. The goal is not to bureaucratize innovation, but to create enabling infrastructure—scaffolds that support experimentation without controlling it.

In many cases, this meant resisting the urge to solve every challenge with a platform. Leaders intentionally prioritized people over products, focusing on building internal capacity, networks of trust, and context-sensitive supports. Technology was used to amplify—not replace—human relationships.

To navigate limited time and resources, institutions adopted strategies like trust-based delegation and smart scaling. For example, instead of attempting to roll out a new practice across the entire institution, teams worked with departments that were ready and willing. They documented learnings, adapted supports, and used those early wins as launchpads for broader adoption. This adaptive approach mirrored the values of academic innovation itself: iterative, learner-centered, and grounded in context.

The NASEM study echoed this finding: the most sustainable innovation practices were those grounded in the local culture, co-created by diverse stakeholders, and deeply attentive to equity (Vito et al., 2025). When innovations reflected shared values and addressed real needs, they gained traction without needing enforcement.

Designing for Longevity: Recommendations for Cultural Infrastructure

To build cultures of innovation that endure, institutions must shift their focus from isolated initiatives to infrastructures of practice. Based on the patterns that emerged across institutional narratives and the broader literature, we offer the following recommendations:

- Build rituals, not just programs. Design regular, visible practices—like showcases, studio sessions, or reflective roundtables—that reinforce innovation as a way of working. These need not be large-scale to be impactful.
- Invest in cultural “middle layers”. Middle managers, coordinators, and cross-functional leads often carry the culture. Equip them with time, training, and autonomy to support innovation within their spheres of influence.
- Decentralize control, centralize values. Create flexible frameworks that allow different units to adapt approaches to their context while staying aligned on core principles like equity, inclusion, and student success.
- Make innovation visible and legible. Document and share stories of experimentation—not only successes but also learnings from failed or revised efforts. Normalize the idea that iteration is a strength and an uncertain outcome is not failure.

- Align incentives with values. Recognize and reward not only outcomes but also contributions to community learning, collaboration, and culture-building. This may include micro-credentials, leadership pipelines, or promotion criteria that reflect innovation contributions.

Ultimately, enculturating innovation is not about controlling the future—it's about preparing the ground for it. It's about creating conditions in which people feel supported to imagine, to test, and to grow together. By embedding the values of collaboration, creation, and connection into the routines and infrastructures of higher education, we make it possible for cultures of innovation to take root and flourish.

CONCLUSION: CHAMPIONING CULTURES OF ACADEMIC INNOVATION

Academic innovation is frequently associated with emergent technologies, novel practices, or structural reforms. However, its most enduring impact lies not in individual tools or initiatives, but in the culture it cultivates—its shared values, routines, relationships, and systems of meaning. When positioned as a cultural phenomenon rather than a technical intervention, academic innovation reveals its true potential: to transform not only what institutions do, but who they become.

This paper has proposed an expanded conceptual framework for understanding and enacting academic innovation as culture-building. Through the lens of the three C's—collaboration, creation, and connection—we have articulated a vocabulary for institutions to reflect on how innovation is practiced, sustained, and scaled. These dimensions provide not only a diagnostic lens but also a design orientation for shaping institutional ecosystems that are equitable, adaptive, and learner-centered.

- **Collaboration** underscores that sustainable innovation is fundamentally relational. It emerges through structures that foster trust, distributed leadership, and cross-functional engagement. In environments where collaboration is intentional and inclusive, innovation becomes collective rather than isolated, and leadership becomes shared rather than siloed.
- **Creation** highlights the role of intentional design in building new practices, tools, and processes. Innovation is not limited to product development or technological experimentation; it also includes the creation of strategic frameworks, pedagogical rituals, and reflective spaces that support meaning-making. By cultivating curiosity, honouring pluralism, and embracing iteration, institutions can build creative capacity across all levels of the organization.
- **Connection** affirms that the significance of innovation lies in its resonance with the communities it serves. Relational scaling—achieved through transparency, belonging, and storytelling—ensures that innovation is not merely disseminated but owned. When students, faculty, and staff recognize themselves in the work, innovation gains authenticity, credibility, and longevity.

Together, these cultural dimensions form a scaffold for institutional transformation that is not episodic but enduring. Yet the development of such a culture requires more than vision statements or strategic plans. It necessitates daily practice, institutional commitment, and sustained investment in the people who carry forward the work of change. It also demands a shift in institutional metrics—from a narrow focus on outcomes and deliverables to a broader understanding of impact, inclusion, and cultural coherence.

This work is not without complexity. Culture-building requires emotional labour, time, and intentionality. It is rarely linear, often invisible, and frequently undervalued within traditional systems of reward and recognition. Nevertheless, it is foundational. Without attention to cultural context, even the most well-resourced innovation efforts risk fragmentation or failure. Conversely, when institutions prioritize culture, they enable innovations to take root, evolve, and scale in ways that are both responsive and responsible.

The call, then, is for institutions and individuals alike to recognize their role as stewards of culture. Whether situated in formal leadership roles or engaged at the margins of institutional systems, all members of the academic community possess the capacity to model, influence, and shape the conditions for innovation. Faculty who invite students into co-creation, staff who experiment with process improvements, administrators who normalize critical reflection—each of these practices contributes to the cultivation of a learning culture grounded in trust, agency, and purpose.

This framework is not prescriptive. Rather, it is intended as an invitation: to examine the implicit norms of academic spaces, to ask which forms of knowledge and labour are valued, and to design cultures in which innovation becomes not a special initiative, but an embedded institutional capacity. To respond to the complexity of contemporary higher education—and to honour the diverse needs of learners, educators, and communities—institutions must move beyond the pursuit of innovation as novelty. Instead, they must commit to the slower, deeper work of transforming the cultures in which innovation is conceived, enacted, and sustained. This is not a peripheral undertaking. It is essential to building academic institutions that are just, inclusive, and resilient. Cultures of innovation are already being cultivated in intentional ways across diverse contexts. The question before us is not whether such transformation is possible—it is whether we will choose to build the conditions in which it can thrive.

AUTHOR NOTES

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AI Usage Statement

Given the rapid evolution of generative AI practices, the authors affirm the importance of openness and transparency in disclosing AI use within academic work. Such statements not only support trust and accountability, but also contribute to the collective exchange of practice, enabling continued reflection on the role and positionality of AI in scholarly contexts.

In this project, generative AI was employed for specific, bounded tasks within the research process. AI-supported search tools—Elicit and Semantic Scholar—were used to assist in identifying initial articles for consideration in the literature review. Zoom’s native transcription tool and Descript AI were used to generate transcripts of Zoom interviews. ChatGPT Plus was used to produce summaries of author reflections as a point of comparison to the human-coded data summaries completed by the authors. Generative AI was not used in drafting the manuscript.

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Reimagining Educational Futures Based on Nature-Based Solutions (NBS): Open Educational Ecoterritorialization in Postgraduate Research Projects

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ABSTRACT

This study begins with the recognition of education as a key element in achieving the Sustainable Development Goals (SDGs), with a particular emphasis on SDG 13 (climate action) and SDG 15 (life on land). Anchored in UNESCO's 2022 report proposing a new social contract for education, the work highlights the urgency of rethinking educational practices to foster sustainable, just, and peaceful futures. The investigation proposes an approach centered on the ecoterritorialization of education, understood as a strategy that integrates sustainability, citizenship, and the transformation of public space. In this context, Nature-Based Solutions (NBS) are presented as promising methods for building open educational practices aimed at preserving natural heritage and integrating local and global knowledge. The research is guided by the following question: how can methodologies associated with NBS contribute to research projects in open educational practices? The main objective is to analyze how different NBS can be applied as a method of open educational ecoterritorialization in a scientific methodology course of the Master's program in Biomedical Engineering at the Federal University of Pernambuco (UFPE). This is a qualitative study, using a case study approach to provide an in-depth analysis of a specific and delimited context. Data collection and analysis were carried out through virtual ethnography (Hine, 2015) and document analysis (Ramos, 2021), focusing on educational resources already published online, with the aim of understanding the practices and cultural artifacts that support this innovative educational approach.

Keywords

Nature-Based Solutions (NBS); Ecoterritory; Open Education; Graduate Studies.

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INTRODUCTION

The adoption of education as a central element in achieving the Sustainable Development Goals (SDGs) represents a turning point for rethinking the role of human development in confronting multiple contemporary crises. In this context, the report "*Reimagining Our Futures Together: A New Social Contract for Education*" (UNESCO, 2021) urges the global community to reconfigure educational systems based on principles of justice, sustainability, solidarity, and interdependence. The proposal is to recognize education not only as a human right, but as a planetary common good, fundamental to shaping futures that preserve life in all its forms.

Among the most pressing global challenges are the climate crisis (SDG 13) and the degradation of terrestrial ecosystems (SDG 15), which require educational actions linked to regenerative and contextually rooted practices. In this context, Education for Sustainability emerges as a fertile field for developing critical, interdisciplinary, and transformative methodologies. This study joins this debate by proposing educational ecoterritorialization as a methodological and epistemological strategy that articulates a commitment to the planet, territories, and local knowledge. Inspired by the concept of ecoterritory (Cordeiro et al., 2014), understood as a space for increasing citizenship, quality of life, and the transformation of public space, this work investigates the potential of Nature-Based Solutions (NBS) as a method of open educational ecoterritorialization. By promoting environmental regeneration combined with community leadership, NBSs prove to be promising avenues for operationalizing the principles of sustainable development in education.

The research begins with the following question: how can NBSs be integrated with open and sustainable educational practices in the context of graduate studies? The choice of graduate studies, in this case, is justified by their centrality in scientific production and the training of researchers with the potential for expanded social and environmental impact. Therefore, this study's main objective is to analyze the relationship between different NBSs and open educational ecoterritorialization in the Scientific Methodology course of the Master's in Biomedical Engineering at the Federal University of Pernambuco (UFPE).

This study adopts a qualitative approach, with a case study design, seeking to understand how pedagogical practices based on NBS were developed, perceived, and integrated into the training process of graduate students. The research is grounded in the frameworks of open education, sustainable pedagogies, and the new social contract for education, seeking to contribute to the field of pedagogical innovation and research committed to the sustainability of territories and the planet.

OPEN EDUCATION MOVEMENT: POTENTIAL FOR EDUCATION AND HEALTH

Currently, the scenarios humanity is experiencing are mediated by information and communication technologies (ICT). Social networks demonstrate the prevalence of this era in social, political,

communicational, and educational contexts. This means that almost all human activities are mediated by the integration of technologies.

In this scenario, the digitalization of institutions in general is growing, and education plays a strong role in this perspective, due to its essential characteristics for humanity. In the context of education, (COPPI et al., 2022) the goal is for all people to be able to communicate, interact, exchange experiences, and learn through digital technologies.

Although this production is focused on the Brazilian context, it is worth presenting evidence of international commitments to the digitalization of education, including: the restructured Lisbon Strategy (European Commission, 2005); the Europe 2020 Strategy (European Commission, 2010); the renewed Digital Education Action Plan 2021-2027 (European Commission, 2020); and the initiative "A Europe Fit for the Digital Age" (European Commission, 2021).

From this perspective, international strategies for the integration and digitalization of education have inspired various areas from the perspective of innovation in the scenarios that permeate DICT. In this regard, the open science and education movement, which responds to the goals and targets of the 2030 Agenda, allows us to affirm that open educational resources, as methodologies, are characterized as a sustainable, innovative method for various scenarios.

Over the past four decades, many rapid transformations have occurred in the technological and scientific sectors, promoting visible impacts on society and provoking changes in politics, social contexts, and culture. Technology has been transforming society and the way we produce and share knowledge.

Education is viewed as a human right in the international community and legitimized in Brazil by the Federal Constitution of 1988 (Brazil, 1988) and the Law of Guidelines and Bases of National Education, established by Law No. 9,396 of 1996 (Brazil, 1996), with the aim of guaranteeing society access to information, knowledge, and improved living conditions. Regarding Article 205 of the Brazilian Constitution,

education is a right of all and a duty of the State and the family. It shall be promoted and encouraged with the collaboration of society, aiming at the full development of the individual, their preparation for the exercise of citizenship, and their qualification for work. (Brazil, 1988, Article 205).

Based on the studies of Astorga et al. (UNESCO, 2008, p. 12), education as a human right and public good allows people to exercise other human rights. Therefore, no one can be exempt or excluded from the educational process. The right to education is exercised to the extent that people, in addition to having access to school, can fully develop and continue learning. This means that education must be of high quality for everyone and throughout life.

From this perspective, education must offer a humanitarian perspective, valuing the complexity of humanity in its social, political, economic, and emotional aspects and interactions. Based on this premise, it is worth highlighting the four pillars presented by UNESCO, aiming at education for life, with a focus on learning – learning to know, learning to do, learning to live together, and learning to learn. More than technical knowledge, knowledge and learning should infer humanity, transformed into values, converted into access to goods and services through the valorization of life.

Open education is considered one of the most important and modern educational movements of the 21st century (Peters & Britez, 2008). Converging with the modern trends in educational society and teaching and learning environments, based on, among others, the convergence and evolution of open educational resources, free software, open access, MOOCs (Massive Open Online Courses), open science, and a range of social and economic changes, the core of this movement goes beyond mere access to content and resources and is associated with a new educational philosophy and new values based on openness, the ethics of participation, and collaboration (idem).

The open education movement emerges with a worldview based on free culture, a liberating vision regarding the use of educational productions. Thus, given the diversity of supporters of the open education movement, this article was based on the concept presented by Deimann & Farrow (2013) and Aires (2016) who "consider contemporary open education to represent a powerful fusion of information technologies, internet literacy, and pedagogical innovation." Open education can be related to technology or not. Thus, in this context, Deimann and Farrow, and Aires state that "contemporary open education is also an online open education, mediated by digital artifacts, networks of relationships, and cultures on the Internet".

SUSTAINABLE DEVELOPMENT GOALS: AGENDA 2030

Currently, given the modern scenario, it is necessary to consider caring for the planet as well as promoting the safety and preservation of natural heritage—that is, caring for nature at the same time as humanity. From this perspective, one of humanity's greatest challenges, according to (Ramos et al., 2024), is associated with investigating and identifying necessary measures for human development, preserving the quality of the environment and, consequently, healthy lives, for the benefit of future generations.

In 2015, the United Nations (UN) issued a global appeal, which was realized through the Sustainable Development Goals (SDGs). These goals aim to mobilize nations around the world to minimize or end poverty, preserve the environment and climate, and ensure that people can live in a peaceful society. The following figure illustrates the representation of the SDGs, and each goal will be described in detail later.



Figure 1. Sustainable Development Goals (SDGs) Source: United Nations (2015)

In the light of the above, based on this UN appeal, seventeen goals and one hundred and ninety-six targets were established to be achieved in the 2030 Agenda in Brazil and worldwide. These are:

- SDG 1 - No Poverty - End poverty in all its forms everywhere, comprising seven targets.
- SDG 2 - Zero Hunger and Sustainable Agriculture - End hunger, achieve food security and improved nutrition, and promote sustainable agriculture, comprising eight targets.
- SDG 3 - Good Health and Well-being - Ensure healthy lives and promote well-being for all at all ages, comprising 13 targets. SDG 4 - Quality Education - Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all, comprising 10 targets.
- SDG 5 - Gender Equality - Achieve gender equality and empower all women and girls, comprising 9 targets.
- SDG 6 - Clean Water and Sanitation - Ensure availability and sustainable management of water and sanitation for all, comprising 8 targets.
- SDG 7 - Affordable and Clean Energy - Ensure access to affordable, reliable, sustainable, and renewable energy for all, comprising 5 targets.
- SDG 8 - Decent Work and Economic Growth - Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all, comprising 12 targets.
- SDG 9 - Industry, Innovation, and Infrastructure - Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation, comprising 8 targets. SDG 10 - Reduced Inequalities - Reduce inequality within and among countries, comprising 10 targets.
- SDG 11 - Sustainable Cities and Communities - Make cities and human settlements inclusive, safe, resilient, and sustainable, comprising 10 targets.
- SDG 12 - Responsible Consumption and Production - Ensure sustainable consumption and production patterns, comprising 11 targets.
- SDG 13 - Climate Action - Take urgent action to combat climate change and its impacts, comprising 5 targets.
- SDG 14 - Life Below Water - Conserve and sustainably use the oceans, seas, and marine resources for sustainable development, comprising 10 targets. SDG 15 - Life on Land - Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation, and halt biodiversity loss, comprising 12 targets.
- SDG 16 - Peace, Justice and Strong Institutions - Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable, and inclusive institutions at all levels, comprising 12 targets.
- SDG 17 - Partnerships for the Goals - Strengthen the means of implementation and revitalize the global partnership for sustainable development, comprising 19 targets.

Regarding this context, it was necessary to present all the objectives, with the aim of addressing the relationship between Agenda 2030 and science, research and open education, that is, from the theoretical constructs presented in this text, it will be evident that specifically SDG 4 - “quality education”, promotes a direct relationship with the open movement as well as SDGs 13 and SDG 15 as a base factor of this study.

REIMAGINING OUR FUTURE TOGETHER: EDUCATION AS A PILLAR OF THE SDGS

The publication "*Reimagining Our Futures Together: A New Social Contract for Education*", released by UNESCO in 2021, proposes a profound reflection on the transformative role of education in the face of the challenges of the 21st century. In times marked by growing inequalities, environmental crisis, accelerated technological advancement, and the erosion of trust in democratic institutions, it is urgent to rethink the ways we learn, teach, and live together.

UNESCO's proposal is anchored in an essential principle: education is a common good and must be reimagined as a collective act of building more just, sustainable, and peaceful futures. This means going beyond the instrumental logic of education focused solely on the labour market, recognizing its potential to develop critical, compassionate individuals committed to social transformation.

In this sense, the Sustainable Development Goals (SDGs)—especially SDG 4, which addresses quality education—appear as a guiding compass. But the SDG agenda demands more than quantitative targets: it requires the development of ethical and ecological consciences, capable of acting locally with a global vision.

The UNESCO report proposes a new social contract based on three interdependent pillars:

- Solidarity and collaborative pedagogies: rethinking the roles of teachers, students, and communities, promoting horizontal relationships and learning based on projects, experiences, and the dialogue of knowledge.
- Relevant and inclusive curricula: centered on social, climate, and epistemic justice, valuing cultural diversity and the wisdom of traditional peoples.
- Open and hybrid educational environments: that transcend school walls and articulate formal, informal, and informal learning spaces—including the critical and creative use of digital technologies.

The lessons that emerge from this vision directly connect with the SDGs, as they position education as a cross-cutting strategy capable of driving all dimensions of sustainable development – from poverty eradication (SDG 1) to climate action (SDG 13), including gender equality (SDG 5), health (SDG 3), peace (SDG 16), and innovation (SDG 9).

"*Reimagining Our Futures Together*" therefore invites us to make a collective commitment to the regeneration of the planet and human dignity. It is a call for students, educators, administrators, scientists, communities, and governments to unite around an educational project that not only prepares for the future, but creates it – with justice, beauty, and hope.

THE NEW SOCIAL CONTRACT OF EDUCATION AND THE SDGS

The UNESCO report presents us, a priori, with a reflective appeal for thinking and acting in the context of education, but in a transcendent discourse – it goes beyond educational settings and relates to themes involving societies, humanity, life, and the Earth. In other words, it seeks to reimagine our futures together, taking into account the context of the increasing integration of new technologies into existing societies on Earth. This appeal, in principle, is made in the context of education. Also in this context, "we all have an obligation to current and future generations," therefore, we must consider and appropriate means that make it possible to "ensure that our world is one of abundance, not scarcity, and that all enjoy the same human rights to the full" (UN, 2022).

In this report, UNESCO also categorically presents the threats that humanity and planet Earth have faced in relation to climate issues. However, it highlights the importance of education within a new social contract, meaning it is necessary to rethink pedagogical and methodological practices with a view to redressing injustices as future transformations unfold.

It is worth noting that the report of the International Commission on the Future of Education recognizes the power of education to effect profound change, thus addressing significant challenges in fulfilling the promise of ensuring the right to quality education for all (SDG 4) and instigating sustainable transformations.

Because the report in question is based on the constructs of reimagining practices focused on education, and in line with the various essential themes of humanity, it highlights the transformative role of education as a sustainable path.

In this context, the Sustainable Development Goals (SDGs) are presented as a relevant element of the reimagining report. This means that this study highlights some SDGs that represent and directly respond to global concerns that can be enhanced by education.

SDG 13 - Climate Action - Take urgent action to combat climate change and its impacts; and SDG 15 - Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation, and halt biodiversity loss.

CONCEPT AND POTENTIAL OF NATURE-BASED SOLUTIONS (NBS)

Nature-Based Solutions (NBS) represent an innovative and integrative approach to addressing contemporary social and environmental challenges through the valorization and regeneration of natural ecosystems. More than just conservation actions, NBS involve sustainable strategies that promote simultaneous benefits for biodiversity, the climate, and human communities. When connected to education, they become even more powerful: they form a foundation for transforming knowledge, territories, and futures.

The relationship between NBS and the Sustainable Development Goals (SDGs) reveals fertile ground for developing policies, practices, and pedagogies that combine environmental care, social justice, and innovation. Three SDGs, in particular, stand out in this connection:

- SDG 4 – Quality Education

Integrating NBS into education means reconfiguring curricula, spaces, and methodologies based on an ecological, territorialized, and experiential pedagogy. Schools, universities, and community centers can

become living laboratories where students learn with and in nature, developing socio-environmental skills, systemic thinking, and a sense of belonging. This approach also helps bridge the gap between academic knowledge and local knowledge, fostering a more inclusive, relevant, and engaged education focused on real-world challenges.

- SDG 13 – Climate Action

NBS are essential for climate mitigation and adaptation. Forest restoration, mangrove protection, regenerative agriculture, urban green infrastructure, and integrated water management are examples of solutions that reduce greenhouse gas emissions and increase the resilience of territories to extreme events. When these practices are combined with education, they enhance the development of climate-conscious agents capable of proposing and implementing local actions with global impact.

- SDG 15 – Life on Land

Protecting, restoring, and promoting the sustainable use of terrestrial ecosystems is one of the core objectives of NBS. They play a direct role in biodiversity conservation, combating desertification, soil degradation, and the loss of natural habitats. Incorporating these themes into educational practices promotes learning anchored in the ethics of care, the recognition of the rights of nature, and the appreciation of biodiverse territories as spaces of life, culture, and resistance.

OPEN EDUCATIONAL ECOTERRITORIALIZATION

The concept of ecoterritory emerges as a response to contemporary societal challenges, proposing an integrated territorial approach that considers the environmental, social, cultural, and economic dimensions of sustainable development. More than a physical space, territory is understood as a complex reality, where biophysical components and human, social, and symbolic uses intertwine. Ecoterritory is therefore proposed as a strategy for territorial management and local development, capable of articulating endogenous resources, scientific knowledge, citizen participation, and educational practices in favor of sustainability.

This model is anchored in three main components: (1) scientific, emphasizing the role of the physical geographer in the analysis of geosystems and informed territorial planning; (2) pedagogical, promoting the development of Local Educational Projects and civic-educational centers that foster lifelong environmental education; and (3) strategic territorial development, based on the development of sustainable plans that value biophysical heritage and foster the creation of local value.

The creation of a "territorial brand" based on thematic clusters and participatory plans – such as the 2030 Agenda – reinforces the proposal to transform public space and increase citizenship. The ecoterritory, thus, becomes a living laboratory for innovation, knowledge production, and the promotion of quality of life, integrating educational, scientific, and political strategies in line with the Sustainable Development Goals.

The concept of ecoterritorialization, as presented by Cordeiro et al. (2014), arises from the need to consider territory not only as a geographic space, but as a symbolic place for civic, ecological, and cultural development. Educational ecoterritorialization therefore presupposes a reconfiguration of educational space beyond institutional boundaries, incorporating the dimensions of nature, community, and local culture into the teaching-learning process.

Adapting this approach to the postgraduate context requires the creation of methodological paths that value territory as an epistemological and practical field. In other words, it involves integrating territorial experiences into the training curriculum, transforming lived space into a laboratory for research and sustainable intervention. In this context, open education expands the possibilities of this ecoterritorialization by promoting knowledge sharing, curricular flexibility, and the use of digital technologies as mediators of experiences.

OPEN EDUCATION IN GRADUATE STUDIES AND INNOVATIVE METHODOLOGIES: OPEN PRACTICES, DIGITAL EDUCATION, AND THEIR RELATIONSHIP TO SUSTAINABILITY

In the current scenario of global transformation and the urgency for sustainable solutions, higher education—especially graduate studies—is called upon to rethink its methods, purposes, and ways of engaging with the world. In this context, open education emerges as an essential approach to promoting access to knowledge, fostering pedagogical innovation, and strengthening universities' commitment to the Sustainable Development Goals (SDGs).

Open education is anchored in principles such as free access to knowledge, sharing of open educational resources (OER), peer collaboration, and active student participation in the construction of knowledge. In the context of graduate studies, this means going beyond the limits of the traditional classroom and fostering the creation of distributed, interdisciplinary, and situated learning ecosystems within territories and within real-world societal challenges.

Innovative methodologies such as open educational practices, which involve everything from the production and reuse of open materials to collaborative networked projects, are gaining prominence in this movement. and critical digital education, which explores technologies not only as tools, but also as environments that enhance authorship, co-learning, and the integration of students into broader scientific and social communities.

These practices connect directly to sustainability, not only from an environmental perspective, but also in social, cultural, and epistemic dimensions. By opening up knowledge, promoting equitable access, and encouraging the collaborative production of contextualized solutions, open education contributes to strengthening scientific citizenship, cognitive justice, and building more resilient futures.

Furthermore, when integrated with approaches such as project-based research, ecoterritorial learning, and citizen science, these methodologies promote the immersion of graduate students in real processes of territorial and environmental transformation, expanding the social impact and relevance of research (Amaral & Santos, 2020). Therefore, by adopting open education models and innovative methodologies in graduate programs, higher education institutions not only modernize their curricula but also align themselves with an ethical and political commitment to building more sustainable, inclusive, and democratic societies. This means reimagining the university as a space for the collective creation of knowledge, technologies, and practices for the common good.

Open education is a paradigm that seeks to democratize access to knowledge, promote collaborative practices, and ensure the adaptability of the teaching-learning process. In graduate programs, this concept unfolds in pedagogical strategies that value student autonomy, the use of open educational resources (OER), project-based work, and the integration of research and social practice.

Innovative methodologies, when combined with the principles of open education, enable the creation of more dynamic, responsive learning environments focused on real-world challenges. In this context, incorporating NBS as a pedagogical practice becomes a promising strategy, as it allows students to experience environmental problems and experiment with sustainable solutions within and outside the academic environment. This perspective stimulates not only the production of knowledge but also engagement with the socio-environmental transformation of territories.

METHODOLOGY

This research adopts a qualitative, exploratory approach, focusing on understanding the processes and meanings attributed by participants in a specific educational context. The methodological design is based on a case study (Yin, 2016), chosen because it allows for an in-depth analysis of a contemporary phenomenon embedded in a real-world context: the incorporation of Nature-Based Solutions (NBS) as a learning methodology in the Scientific Methodology course of the Master's in Biomedical Engineering at the Federal University of Pernambuco (UFPE).

The context of the study is delimited by the pedagogical experience developed in the Scientific Methodology course, offered on an ongoing basis in the Graduate Program in Biomedical Engineering (PPGEB/UFPE), which focuses on the connection between scientific research, sustainability, and open educational practices. The research corpus consists of theoretical and practical productions developed by students in the course, published in digital collections available on the READS research group portal and in the UFPE ATTENA institutional repository. Three collections were analyzed, covering the 2023.2, 2024.1, and 2024.2 semesters, which bring together studies guided by methodologies based on nature-based solutions and processes of educational ecoterritorialization.

Two main techniques were used for data collection and analysis:

- Virtual ethnography (Hine, 2015), which allowed for the observation and interpretation of cultural artifacts, interactions, and pedagogical dynamics in the course's digital environment, including discussion forums, online presentations, class records, and open educational resources produced by students.
- Document analysis (Ramos, 2021), which focused on the systematic examination of teaching materials, student-developed projects, teaching plans, activity outlines, and other formal course records.

The triangulation of these techniques enabled a thorough and critical analysis of how NBS were understood, appropriated, and applied by students in their research, as well as the role of open digital education in promoting sustainable and territorialized practices in the postgraduate context. The adopted methodology thus favoured the analysis of the formative potential of NBS as pedagogical and epistemic devices in the scientific training of master's students committed to contemporary socio-environmental challenges.

Regarding the limitations and ethical considerations of this study, critical reflections were made on the virtual and documentary nature of the research, thus respecting the ethical principles of data integrity. One limitation of the study is the impossibility of longitudinally monitoring the developments of the projects in community contexts, since the scope of the course was semester-long.

RESULTS

Identification and Description of the NBS Covered in the Course: Examples of Real Cases, Projects, and Activities

Based on the Scientific Methodology course outline of the UFPE Biomedical Engineering Graduate Program, as well as the collected works, it is clear that this educational space is designed not only for the development of research skills but also for expanding the critical awareness of master's students in the face of contemporary scientific and social challenges. In this sense, sustainability was integrated into the curriculum as a cross-cutting axis, guiding the selection of topics, methodological strategies, and objects of study throughout the course.

It is clear that the pedagogical proposal seeks to go beyond a technical approach to scientific methodology, promoting the connection between epistemology, research ethics, and socio-environmental responsibility. The introduction of Nature-Based Solutions (NBS), the 2030 Agenda, and the SDGs as a theoretical and practical focus offers a concrete opportunity for students to reflect on the environmental and social impacts of science, while exploring avenues for innovation supported by ecological principles.

By being invited to investigate, systematize, and apply the NBS concept in their own projects or contexts, master's students are encouraged to reimagine the role of biomedical engineering in building more resilient and integrated futures. Classroom discussions, guided studies, and research projects developed throughout the course have revealed a growing critical appropriation by students of the SDGs—especially Goals 4 (quality education), 13 (climate action), and 15 (life on land)—as guiding principles for their research.

In this context, this integration of science education, open practices, and sustainability enables the development of researchers more sensitive to socio-environmental complexities, prepared to propose solutions that engage with local knowledge, biodiversity, and the rights of future generations. The discipline, therefore, serves as a pedagogical laboratory for the ecoterritorialization of research, fostering a scientific culture committed to the common good and the principles of ecological and cognitive justice.

Open Educational Ecoterritorialization Strategies: How NBS Were Incorporated And Integrated into the Curriculum

The integration of ecoterritorialization strategies into open education represents an innovative and necessary movement in the face of the socio-environmental emergencies of the 21st century. In the context of graduate studies, particularly in programs that address health-related science and technology, such as the Master's in Biomedical Engineering at UFPE, this approach allows not only for the alignment of the curriculum with the Sustainable Development Goals (SDGs), but also for the training of researchers with a critical stance and commitment to territory, sustainability, and the common good.

The Scientific Methodology discipline has served as a privileged space for pedagogical experimentation in this regard, incorporating Nature-Based Solutions (NBS) as a structuring axis for epistemological reflection and the development of research projects. NBS are presented to students not only as theoretical concepts, but also as methodological strategies and pedagogical practices capable of connecting science, nature, and society in an ethical, collaborative, and contextualized manner.

In developing health research projects, master's students are encouraged to consider the environmental, social, and cultural dimensions of the realities with which they interact. Incorporating NBS into the curriculum serves as an invitation to the ecoterritorialization of scientific practice, encouraging students to think and act from within the territory, understood as a living space of ecological, political, and symbolic interactions. This perspective broadens the field of Biomedical Engineering, traditionally centered on devices and technologies, to include approaches that consider care for life on multiple scales—human, environmental, and planetary.

As part of open education strategies, the course encourages the production of open educational resources (OER), publication in digital repositories, and engagement in collaborative projects. Such practices reinforce the commitment to the democratization of knowledge and the circulation of situated knowledge, in line with SDG 4 (quality education). At the same time, the centrality of NBS in research proposals promotes dialogue with SDG 13 (climate action) and SDG 15 (life on land), establishing an organic relationship between science, education, and sustainability.

Thus, the ecoterritorialization of graduate education, mediated by an open approach supported by NBS, has proven to be a powerful catalyst for epistemological, pedagogical, and political transformations. This creates a generation of researchers who not only master scientific methods but also reimagine the role of science as a regenerative force and ally of nature and life in territories.

The course proposed moments of collaborative mapping, creation of ecocartographies, and the use of open digital tools such as Padlet and Canva. The practices sought to value local knowledge, promote recognition of the territory and encourage interdisciplinarity.

DISCUSSION

The results demonstrate that Nature-Based Solutions (NBS), when used as an active and critical methodology, offer significant opportunities for educational ecoterritorialization in graduate programs. This approach, in line with Cordeiro et al. (2014), allows us to rethink educational spaces not only as environments for knowledge transmission, but as living territories of transformation, anchored in sustainable practices and real-world contexts. The experience in the Scientific Methodology course of the Master's in Biomedical Engineering at UFPE demonstrated the potential for integrating complex socio-environmental problems into academic training, encouraging students to propose innovative and contextualized solutions.

From a pedagogical perspective, the use of NBS proved consistent with the principles of open education by enabling student co-authorship, the appropriation of the territory as a source of research, and the production of situated knowledge. The connection between the formal curriculum and local environmental knowledge highlighted the potential for training more conscientious researchers, sensitive to socio-environmental issues, and prepared to face contemporary challenges, in accordance with UNESCO guidelines (2022) and SDGs 13 and 15. This perspective contributes to training that transcends technicalities, promoting civic and environmental engagement essential for future professionals in Biomedical Engineering and other disciplines.

However, implementing this educational proposal still requires addressing structural challenges. Curricular rigidity, the lack of time and resources for in-depth project development, and the need for greater integration between the university and the community are all aspects that require improvement. Overcoming these barriers will allow the application of NBS in graduate education to

reach its full potential, fostering more relevant and impactful research. The pilot experience at UFPE, despite its limitations, offers a promising model for integrating innovative and sustainable pedagogical approaches into academia.

CONCLUSION

This study demonstrated that Nature-Based Solutions (NBS) can be effectively incorporated as a teaching methodology in graduate programs, promoting an open and sustainable educational ecoterritorialization. The experience reported in the Scientific Methodology course of the Master's in Biomedical Engineering at the Federal University of Pernambuco (UFPE) indicated promising paths for reimagining scientific training in a way that is more integrated with the socio-environmental reality of the territories.

The main findings highlight the ability of NBS to strengthen the relationship between education and territory, the appreciation of local knowledge, and the development of innovative and sustainable pedagogical practices that empower students to propose solutions to real challenges. The approach fostered students' connection with their communities and fostered a deeper understanding of the application of scientific knowledge for sustainable development.

For future research, we recommend exploring different ways of integrating NBS, open education, and curricular practices at other levels and fields of knowledge. It would be important to investigate the long-term sustainability of developed projects and their effective social and environmental impacts on the community. For pedagogical practice, we suggest creating more flexible environments with longer workloads for project development, as well as establishing stronger partnerships between universities and communities to facilitate the implementation and monitoring of NBS.

By adopting NBS as a pedagogical tool, higher education institutions can not only train future researchers and professionals but also actively contribute to building more resilient, equitable futures aligned with the principles of global sustainability.

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Open Pedagogy: Innovation in the Classroom with Inclusive OER

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ABSTRACT

This paper presents an open pedagogical approach implemented in a Brazilian postgraduate course that integrates inclusive open educational resources (OER), artificial intelligence (AI), and alignment with the Sustainable Development Goals (SDGs). Developed within the Graduate Program in Biomedical Engineering at the Federal University of Pernambuco (UFPE), the initiative engaged students as co-creators of socially relevant research outputs. Across three academic years (2022–2024), students used generative AI tools to support research design and scientific writing, while aligning their work with SDG-related themes. Their contributions resulted in open-access digital books organized as thematic collections. Thematic analysis of the student-authored volumes reveals increasing maturity in the use of AI, deeper engagement with sustainable development challenges, and greater inclusion of diverse perspectives. This pedagogical model emerges as a response to persistent barriers in Brazilian postgraduate education, such as epistemic inequality, limited methodological training, and the dominance of Eurocentric publishing standards. By fostering digital fluency, research competencies, and critical engagement with global agendas, the model contributes to a more equitable and participatory academic culture. It aligns with the principles of open science, transformative education, and ethical innovation, as promoted by recent frameworks including the United Nations 2030 Agenda and UNESCO's declarations on open education. The experience highlights how AI-enhanced, OER-based learning in public universities can expand student agency, support epistemological diversity, and promote socially responsive research in the Global South. The model offers a replicable and scalable contribution to reimagining postgraduate education through the lens of openness, collaboration, and social justice.

Keywords

open pedagogy; inclusive OER; artificial intelligence; postgraduate research; sustainable development goals; Brazil higher education; pedagogy innovation; digital inclusion; open science; compassionate education,

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INTRODUCTION

Higher education in Brazil has witnessed remarkable transformations in the past two decades, especially through digitalization, expansion of postgraduate programs, and emphasis on socially engaged research. Nevertheless, significant challenges remain regarding access, equity, research competencies, and alignment with global development agendas. These advances are part of a global context of increasing recognition of open science, digital inclusion, and educational innovation as pillars of sustainable development. Many postgraduate students, particularly those from underrepresented backgrounds, struggle with scientific writing, methodological planning, and linking their research to broader frameworks such as the Sustainable Development Goals (SDGs).

The Brazilian postgraduate system, coordinated primarily by Coordination for the Improvement of Higher Education Personnel (CAPES - Coordenação de Aperfeiçoamento de Pessoal de Nível Superior), has made strides in encouraging internationalization, innovation, and interdisciplinary research. However, the academic culture still tends to privilege Eurocentric paradigms and English-only publication standards, often at the expense of local, plurilingual, and socially relevant knowledge. Such a scenario reinforces structural barriers that limit epistemological diversity and the recognition of traditional and community-based knowledge.

In this context, the integration of open pedagogy, inclusive open educational resources (OER), and artificial intelligence (AI) emerges as a promising response to democratize academic production and support student agency. Initiatives in this direction align with the principles of transformative education and citizen science, valuing student agency, interdisciplinary collaboration, and the ethical use of technology. Recent literature indicates that generative AI, when integrated critically and guided by ethical principles, can enhance practices such as scientific writing, peer review, and data curation (Veletsianos et al., 2023; UNESCO, 2024)

This paper presents an open pedagogical approach implemented in a master's-level course at the Federal University of Pernambuco (UFPE – Universidade Federal de Pernambuco), in the Graduate Program in Biomedical Engineering (PPGEB – Programa de Pós-Graduação em Engenharia Biomédica). The initiative aimed to address the gap between research training and social impact by engaging students as co-creators of knowledge, aligning their projects with the SDGs, and leveraging AI tools to support academic writing. Drawing from experiences across three cohorts, the study highlights how this integrated model fosters research competencies, inclusivity, and socially responsive inquiry.

By exploring the connections between AI-assisted research design, OER production, and SDG alignment, this paper contributes to the growing body of literature on open education in the Global South. It argues that fostering epistemic justice, digital fluency, and ethical innovation in postgraduate

education requires reimagining teaching practices to be more participatory, inclusive, and oriented toward the public good, in alignment with the principles set forth in the United Nations 2030 Agenda for Sustainable Development (United Nations, 2015) and the UNESCO Dubai Declaration on Open Educational Resources (2023), which advocate for equitable and inclusive access to knowledge through digital public goods and emerging technologies. These frameworks, along with the vision articulated in the UNESCO Digital Learning Week 2025 concept note (UNESCO, 2025), reinforce the importance of AI and OER integration to foster socially just, collaborative, and human-centred digital learning ecosystems, highlighting the strategic role of public universities as living laboratories of social, technological, and pedagogical innovation.

CONCEPTUAL BACKGROUND

The pedagogical model adopted in this study is grounded in three interconnected frameworks: open pedagogy, inclusive OER, and ethical use of artificial intelligence in education. Each of these components contributes to reconfiguring traditional hierarchies in academic knowledge production, particularly in the context of Latin American higher education.

Open Pedagogy

Open pedagogy refers to educational practices that emphasize learner participation in the creation and sharing of knowledge. Unlike traditional pedagogies that treat students as consumers of static content, open pedagogy positions learners as active agents who collaboratively shape the learning process (Wiley & Hilton, 2018). In this model, students are encouraged to publish, remix, and engage with OER, expanding their roles as knowledge producers.

This approach aligns with the concept of open educational practices (OEP), which involves not only the use of Open Educational Resources (OER), but also the redesign of pedagogical methodologies to foster participation, co-creation, and the development of critical competencies (Cronin, 2017). OEP strengthen student agency, promote digital authorship, and encourage situated and collaborative learning, aligning with emancipatory pedagogical proposals.

Open pedagogy also shares principles with Freirean critical pedagogy by proposing that knowledge should be constructed dialogically and contextually, valuing students' prior experiences and knowledge (Freire, 1996). This perspective expands the educator's role from transmitter to mediator, and the student's role from passive recipient to active subject in the construction of knowledge.

In postgraduate contexts, this approach challenges conventional authorship norms and promotes more equitable forms of academic participation. It aligns with the epistemological shift toward open science, where transparency, accessibility, and collaboration are valued as core academic principles. Beyond producing finalized outputs, the pedagogical model encourages the socialization of research processes — sharing drafts, preliminary ideas, and methodological strategies — fostering a culture of exchange among peers.

Such practices are compatible with the principles of open science, which advocates not only for the openness of data and publications but also for making the stages of the scientific process accessible to collaboration, review, and broader participation (Fecher & Friesike, 2014). This enables graduate students to experience a form of education that is more connected to social challenges, critical thinking, and the collective production of knowledge.

This collective dimension enhances opportunities for inter-project dialogue, co-creation, and interdisciplinary learning, allowing students not only to publish but also to reflect and refine their work through ongoing peer engagement and feedback.

As DeRosa and Jhangiani (2017) highlight, open pedagogy invites educators to reimagine the curriculum as an open space where learners not only consume knowledge but also construct and share it in ethical and meaningful ways. It is, therefore, a pedagogy that integrates technological, epistemological, and political practices, embracing a commitment to a more just, critical, and collaborative education.

Inclusive Open Educational Resources (OER)

Inclusive OER are those that not only adopt open licenses (such as Creative Commons) but also consider linguistic, cultural, and epistemic diversity. In Brazil, where Portuguese is the primary language of instruction and research, the creation of locally relevant, multilingual OER is critical to counterbalance the dominance of English-language scientific literature. Drawing on Finardi & Santos (2022), this study adopts the perspective that OER should serve as tools for linguistic inclusion, social justice, and decolonization of curricula. This means embracing knowledge systems from the Global South, enabling students to publish in their own languages, and recognizing the value of applied, community-centred research.

In this sense, inclusive OER contribute to epistemic justice by breaking with the logic of silencing historically marginalized voices and by valuing subaltern knowledges, such as those of Indigenous, quilombola, popular, and peripheral communities (Santos, 2010; Menezes, 2018). This approach aligns with the concept of an ecology of knowledges, proposed by Boaventura de Sousa Santos, which calls for the recognition of the diversity of ways of knowing and the legitimacy of epistemologies beyond hegemonic Western science.

This understanding is further supported by Ossiannilsson and others (2020), who argue that openness must be rooted in epistemic plurality and social context to avoid reinforcing historical patterns of exclusion. They emphasize that inclusive open education requires intentional engagement with local realities, indigenous knowledge systems, and historically marginalized voices. Without this, open approaches risk remaining extractive or tokenistic. In this sense, inclusive OER are not only a matter of licensing or format but of power, recognition, and the co-construction of meaning within specific sociopolitical contexts (Ossiannilsson et al., 2020).

The implementation of inclusive OER in the UFPE postgraduate program reflects the broader discourse on the role of open education in promoting social inclusion and educational transformation. Arinto et al. (2017) argue that while OER have the potential to democratize access to knowledge in the Global South, this potential can only be realized if open practices are designed with attention to contextual inequalities and historical exclusions. Similarly, Coelho, Balula, and Ramos (2015) emphasize that the adoption of OER in higher education requires not only access to digital infrastructure but also changes in pedagogical culture, institutional support, and faculty training. The UFPE initiative addresses these challenges by enabling students to co-create multilingual, contextually relevant OER, grounded in their communities and research realities. In doing so, it demonstrates how inclusive OER can act as tools for epistemic justice, curricular decolonization, and socially engaged postgraduate education.

Such practices also resonate with the Open Science movement by promoting transparency, collaboration, and democratic access to knowledge (Fecher & Friesike, 2014), strengthening an academic culture that values diversity and ethical commitment to the communities involved.

Ethical AI in Higher Education

The use of AI tools in education, particularly generative language models, has sparked both excitement and concern. While AI can support students in planning, organizing, and refining academic texts, it also raises ethical questions regarding authorship, originality, and academic integrity. These concerns also involve the risk of technological dependency, the reproduction of algorithmic biases, and the erasure of human creative processes, especially in educational contexts that value critical and situated authorship (Selwyn, 2019).

UNESCO (2023) has emphasized the importance of human-centred AI that respects privacy, equity, and pedagogical intention. This guideline is especially relevant in the context of higher education, where the development of students' intellectual autonomy and argumentative skills should be prioritized in any technological mediation. Moreover, it is necessary to reflect on the role of institutions in creating policies that guide the responsible use of these technologies, ensuring transparency, equitable access, and digital inclusion (Williamson & Eynon, 2020).

In this course, AI tools were used not as substitutes for human creativity but as scaffolding mechanisms to support student learning. The pedagogical emphasis was on critical engagement with AI outputs, promoting reflective and intentional use. This approach aligns with the concept of Explainable AI (XAI), which advocates for users to understand how systems operate and make decisions—an essential aspect for ensuring that the use of AI in education is ethical, trustworthy, and formative (Gunning & Aha, 2019).

Pedagogical practices involving AI should be aligned with the development of students' digital and information literacy competencies, as highlighted by the European Framework for the Digital Competence of Educators (DigCompEdu), which emphasizes critical literacy regarding emerging technologies as an essential part of teacher and student education (Redecker, 2017). The pedagogical use of AI, therefore, should be planned in a way that enhances critical awareness, fosters authorship, and strengthens ethical responsibility in the use of intelligent technologies.

METHODS

The pedagogical model was implemented in the course Scientific Methodology and Academic Production (Metodologia Científica e Pesquisa Experimental – Scientific Methodology and Experimental Research), offered in 2023 and 2024 within the PPGEB at UFPE. The 60-hour course was designed with a hybrid format, combining synchronous sessions with asynchronous activities via the Moodle platform, with the participation of external professionals. The student group included professionals from various regions of Northeastern Brazil, many of whom were first-generation graduate students or worked in public health, education, and technology.

The course design followed four main pillars:

1. **SDG Mapping:** Students were introduced to the United Nations 2030 Agenda and asked to identify how their research questions aligned with specific SDGs and targets. Activities included guided readings, collaborative mapping, and discussion forums.

2. Engagement with Inclusive OER: A central set of resources used were the three volumes of the *Coletânea de Estudos Teórico-Práticos na Engenharia Biomédica* (Ramos & Gusmão, 2024a, 2024b, 2025), authored by previous student cohorts and openly licensed under Creative Commons. These volumes were used both as content and as models for student-authored publication.
3. AI-Supported Academic Writing: Students engaged with AI tools (ChatGPT, Scite.ai, Grammarly) for tasks such as refining research questions, outlining abstracts, and simulating peer review. Emphasis was placed on critical and ethical use, with reflection prompts and collective discussions on benefits and risks.
4. OER Production: Each student authored a short paper (1,200–1,500 words), reviewed by peers and instructors. Final versions were compiled into open-access eBooks under a CC BY-SA 4.0 license, archived in the ATTENA – UFPE Digital Repository. ATTENA is the institutional digital repository. It aims to preserve, disseminate, and provide open access to the academic and scientific output of the university. The repository includes theses, dissertations, academic journals, e-books, open educational resources, and other scholarly materials produced by the UFPE community. ATTENA supports open science practices and is aligned with international standards for digital preservation and metadata.

Qualitative data collection included course analytics, student reflections, discussion transcripts, and analysis of the final outputs. Ethical approval and informed consent were obtained, and student identities are anonymized.

SDG ALIGNMENT IN STUDENT-AUTHORED OPEN EDUCATIONAL RESOURCES

This section presents a comparative analysis of the three volumes of the *Coletânea de Estudos Teórico-Práticos na Engenharia Biomédica*, focusing on how each set of student-authored chapters addresses the Sustainable Development Goals (SDGs). Rather than treating the series as a single corpus, we examine each volume in its specificity to illustrate the evolving integration of SDG-aligned research topics, AI tools, and open educational practices.

A qualitative content analysis was conducted on all chapters from the *Coletânea de Estudos Teórico-Práticos na Engenharia Biomédica*, Volumes 1, 2, and 3, to identify the Sustainable Development Goals (SDGs) explicitly or implicitly addressed by the research themes. The aim was to understand how student-authored works reflect the integration of global development agendas into local, applied research.

Each chapter was reviewed and classified according to its main SDG alignment, with particular attention to the problem investigated, the proposed technological solution, and the population or system targeted. The table below summarizes the findings:

Volume 1 - *Coletânea de Estudos em Engenharia Biomédica* (2023)

The first volume marked the initial implementation of the open pedagogy model in the UFPE postgraduate course. Chapters primarily explored SDGs 3 (Good Health and Well-being), 4 (Quality Education), and 10 (Reduced Inequalities). Topics included neonatal health monitoring, digital platforms for remote education, and the development of low-cost biomedical devices. Students

approached the SDGs as a framework for contextualizing their work but had limited prior experience with AI-assisted writing.

Table 1: SDG Alignment and Tools in Volume 1 (2022)

Chapter (Author(s))	Main SDGs	Use of AI Tools	OER Integration
Silva, Ramos & Gusmão	3, 4, 10	ChatGPT, Perplexity, DALL·E, Canva	AI used to generate and translate OER
Santana, Ramos & Gusmão	3, 4, 10, 13	ChatGPT	AI-supported OER in Planetary Health
Sales, Ramos & Gusmão	3, 4, 10	ChatGPT, Perplexity	OER with accessibility and open education principles
Soares, Ramos & Gusmão	3, 4, 5	ChatGPT	OER developed with AI support
Silva, Ramos & Gusmão	3, 4, 10	ChatGPT, Perplexity, DALL·E	OER with visual aids and AI-generated images
Silva, Ramos & Gusmão	3, 4	ChatGPT	Discussion on data policies and AI-enhanced OER
Silva, Ramos & Gusmão	3, 4	ChatGPT, Canva	Collaborative OER production based on local data
Jatobá, Ramos & Gusmão	3, 4, 11	ChatGPT	OER in telehealth, aligned with FAIR principles
Lima, Ramos & Gusmão	3, 4, 10	ChatGPT	OER for continuing professional development in SUS

The volume demonstrated students' interest in aligning technical research with social relevance. However, some chapters showed early stage understanding of the SDG framework. Many students reported using digital tools such as reference managers and text editors but had not yet adopted generative AI tools systematically.

Volume 2 - *Coletânea de Estudos em Engenharia Biomédica* (2024)

In the second edition, there was a clear expansion in both thematic diversity and methodological sophistication. SDGs such as SDGs 3 (Good Health and Well-being), 9 (innovation and infrastructure) and 10 (Reduced Inequalities) emerged more prominently. Chapters addressed topics like assistive technologies for women in rural areas, inclusive design for people with disabilities, and environmental monitoring systems.

Table 2 – SDG Alignment and Tools in Volume 2 (2023)

Chapter (Author(s))	Main SDGs	Use of AI Tools	OER Integration
Souza, Ramos, Gusmão, Gama & Siebra	3, 9	ChatGPT	academic review with potential for open science use but not directly aligned with OER frameworks
Martins. Ramos & Gusmão	3, 4	Not mentioned	conceptually aligned with open and continuous professional education
La Puente, Ramos, Gusmão, Santos, & Cassemiro	3, 9	Machine Learning, Neural Networks, EMG signal processing	Not mentioned; academic-scientific review without OER focus
Viana, Ramos, Gusmão, Gama & Silva	3, 4, 10	ChatGPT, DALL-E	OER integrating clinical knowledge and AI-generated content under open access principles
Rocha, Ramos, Gusmão, Gama & Silva	3	Not mentioned	scientific literature review format
Alves, Ramos, Gusmão, Gama & Silva	3	Not mentioned	clinical-scientific focus without OER approach
Cardozo, Ramos, Gusmão & Bastos Junior	3, 9	Not mentioned	scientific-technical review with innovation focus
Botelho, Ramos & Gusmão	3, 4, 10	ChatGPT, Perplexity	OER with open licenses, accessible formats, and inclusive language
Lima, Ramos, Gusmão & Santos	3, 9	Machine Learning, Deep Learning, Artificial Neural Networks	scientific and technical focus without explicit OER licensing
Oliveira, Ramos, Gusmão & Gama	3, 9	Computer Vision, Convolutional Neural Networks (CNN), Machine Learning	academic review with technical focus

Machado, Ramos, Gusmão, Santos, & Cassemiro	3, 9, 10	Machine Learning, EEG Signal Processing, Feature Extraction	research focus without reference to OER or licensing

AI-supported tools (such as natural language generation, automatic summarization, and citation recommendation) were integrated more consistently into students' workflows. Reflection activities helped frame these tools not as shortcuts but as supports for iterative academic writing. Students demonstrated greater confidence in articulating how their projects engaged specific SDG targets and indicators.

Volume 3 - *Coletânea de Estudos em Engenharia Biomédica* (2024)

Volume 3 reflects a matured application of open pedagogy, with students producing research that integrates robust Sustainable Development Goals (SDGs), collaborative community approaches, and advanced AI tools. The chapters address diverse challenges in health, urban sustainability, and social inclusion, demonstrating strong alignment with SDGs 4, 11, 16, and 17. Advanced AI techniques such as data modelling, sentiment analysis, and automated classification were used to analyse qualitative and quantitative data. Notably, OER integration goes beyond text: chapters showcase rich authorial content—diagrams, datasets, open-source code, and GitHub links—all licensed under Creative Commons. Metadata standards were applied to enhance discoverability and reusability (Ramos & Gusmão, 2024).

Several students designed projects in partnership with community health agents, urban planners, or social movements. AI tools were used not only for writing assistance but also for prototyping and data analysis (e.g., sentiment analysis, modelling, or document classification). The concept of "inclusive OER" evolved from content consumption to content creation, with student-authored chapters often including diagrams, data tables, and links to open datasets or GitHub repositories.

Table 3 – SDG Alignment and Tools in Volume 3 (2024)

Chapter (Author(s))	Main SDGs	AI Tools Employed	OER Integration & Licensing
Silva, Ramos & Gusmão	3, 4, 10, 13	ChatGPT, DALL-E, Perplexity	OER developed with open licensing, inclusive language, and accessible formats
Ferreira, Ramos & Gusmão	3, 4, 10	ChatGPT, Perplexity	Open licensing and inclusive formats proposed for microlearning OERs
Souza, Ramos & Gusmão	2, 3, 10	Not mentioned	focus on clinical-nutritional literature review
Lima, Ramos & Gusmão	3, 13	Sentiment analysis	Open narrative with health agents

Silva, Ramos & Gusmão	3, 10, 11	Mobility modeling	3D model files, open code
Mota, Ramos & Gusmão	3, 10	Sensor calibration	Design files, CAD, CC BY-SA
Santos, Ramos & Gusmão	3, 9	Chatbot for screening	Chatbot code, licensed
Moura, Ramos & Gusmão	3, 11	Simulation	3D prototypes, data licensed
Gomes, Ramos & Gusmão	3, 13	AI for literature	Strategy and dataset shared
Aguiar, Ramos & Gusmão	3, 12	Environmental modeling	Methodology and data open
Leite, Ramos & Gusmão	4, 17	Network analysis	Protocol open-access
Oliveira Júnior, Ramos & Gusmão	3, 10	ML classification	Model code and dataset shared
Freire, Ramos & Gusmão	3, 9	Diagnostic algorithm	Algorithm and data open
Araújo, Ramos & Gusmão	3, 10	Data analysis	Open narrative with NGOs
Silva, Ramos & Gusmão	3, 16	Data viz and analysis	Platform code, open dataset
Souza, Ramos & Gusmão	3, 11, 17	Data mapping	Dataset and visuals open
Melo, Ramos & Gusmão	3, 4	Acoustic modeling	Code and audio licensed
Lopes, Ramos & Gusmão	2, 11	Environmental modeling	Photos, datasets, protocols

This volume emphasized open licensing awareness, metadata production, and public dissemination. Chapters were accompanied by reflective essays on the process of publishing in open formats and the ethical implications of biomedical research. The SDG 3 (Good Health and Well-being) appears in 16 chapters. Other frequently addressed goals include SDG 10 (7 chapters), SDGs 4 and 11 (4 chapters), SDG 13 (3 chapters), SDGs 9 and 17 (2 chapters each) and SDG 16 is address in one chapter.

All chapters used open licenses:

- 12 shared open datasets,
- 9 published source code or tools (e.g., GitHub repositories),
- 7 incorporated multimodal OER (e.g., diagrams, 3D models, audio),
- 4 involved co-authorship with community stakeholders,
- 5 applied educational metadata to enhance accessibility and reuse.

Taken together, the volumes illustrate a progression in open pedagogical practice and student agency, showing how postgraduate learners can engage critically with the SDGs while producing high-quality, socially relevant academic outputs.

KEY FINDINGS

- SDG 3: Good Health and Well-being emerged as the most referenced goal, aligning with the field's focus on health technology innovation and biomedical solutions.
- SDG 9: Industry, Innovation, and Infrastructure and SDG 10: Reduced Inequalities also appeared prominently, especially in projects that addressed accessibility and inclusive design.
- The presence of SDG 4 (Quality Education) in some chapters reflects growing interest in educational technologies, multilingual OER, and engineering education equity.
- A smaller but relevant number of projects explored environmental and urban themes (SDGs 11 and 13), particularly those related to assistive technologies and climate-sensitive diagnostics.

Table 4: SDG Mapping of selected chapters from the *Coletânea de Estudos* (Volumes 1–3)

Chapter Title	Volume	Main SDG(s) Addressed	SDG Targets	Keywords
Dispositivos vestíveis para monitoramento cardiovascular	Vol. 1	SDG 3 (Health), SDG 9 (Innovation)	3.4, 9.5	Wearables, heart monitoring
Interface homem-máquina em reabilitação motora	Vol. 1	SDG 3, SDG 10	3.d, 10.2	Accessibility, neuroengineering
Inteligência artificial para triagem de doenças respiratórias	Vol. 2	SDG 3, SDG 13	3.c, 13.1	AI, public health, climate sensitivity
Educação em engenharia biomédica com REA multilíngues	Vol. 2	SDG 4 (Education), SDG 10	4.3, 4.7, 10.2	OER, multilingualism, inclusion
Tecnologias assistivas para mobilidade urbana de idosos	Vol. 3	SDG 11 (Sustainable Cities), SDG 3	11.2, 3.a	Aging, mobility, urban design
Telessaúde e acessibilidade em regiões remotas	Vol. 3	SDG 3, SDG 9, SDG 10	3.8, 9.c, 10.1	Telemedicine, inequality, rural health

This mapping illustrates a robust integration of the 2030 Agenda into student research, validating the potential of open pedagogy to cultivate SDG-oriented academic inquiry. Importantly, the diversity of SDGs addressed across the three volumes reflects both the multidisciplinary nature of biomedical engineering and the contextual specificity of student concerns—ranging from elder care and rural health to urban mobility and digital inclusion.

By producing and publishing their work in open-access volumes under Creative Commons licenses, students not only demonstrated scientific rigor but also contributed directly to the goals of SDG 4.7 (Education for Sustainable Development) and SDG 16.10 (Access to Information). The *Coletânea* thus

becomes more than a pedagogical artifact; it is a living repository of socially engaged science, produced by and for the communities it seeks to serve.

EVALUATION OF THE STUDENT-AUTHORED OPEN EDUCATIONAL RESOURCES

The open pedagogical model described in this paper culminated in the production of a series of openly licensed scientific eBooks titled *Coletânea de Estudos Teórico-Práticos na Engenharia Biomédica*, volumes 1, 2, and 3. These collections represent the collective academic effort of postgraduate students enrolled in the course Metodologia Científica e Pesquisa Experimental during the academic years 2022, 2023, and 2024. Each volume functions as both a scholarly product and a pedagogical artifact, documenting how students engaged with SDGs, academic writing tools, and inclusive OER practices.

Structure and Accessibility

Each volume of the *Coletânea* contains between 8 and 12 short scientific articles, ranging from 1,200 to 1,500 words each. The texts are written in accessible academic Portuguese, and in some cases, authors provided abstracts or keywords in English or Spanish to promote broader dissemination. All volumes were published under a Creative Commons Attribution-ShareAlike 4.0 International (CC BY-SA 4.0) license, allowing remixing and reuse with proper attribution.

The eBooks were formatted using open-source tools (LibreOffice, Canva, and LaTeX when needed) and archived in the institutional repository of the Federal University of Pernambuco (UFPE). Each volume was assigned a unique handle for citation and download tracking, and metadata was curated following open access best practices. As of June 2025, combined downloads from the three volumes exceeded 3,000, with several chapters being cited in other postgraduate theses and extension project proposals.

Pedagogical Role and Impact

The *Coletânea* series served not only as an output but also as a scaffold for learning. Students were invited to review chapters from previous editions as part of their preparation, using rubrics to analyse clarity, SDG alignment, and integration of AI-supported writing tools. In turn, their own contributions became models for future cohorts.

Some chapters have been transformed into conference presentations, poster submissions, or pilot studies in professional settings. Faculty members involved in the course have reported increased student motivation, sense of authorship, and academic confidence following the publication of their work in the collection. Furthermore, the *Coletânea* volumes contributed to broader institutional goals related to open science and public engagement.

Examples of Chapters and Thematic Diversity

Examples of chapters include: (1) an AI-based framework for neonatal monitoring aligned with SDG 3; (2) a study on mobile accessibility apps for elderly urban residents addressing SDG 11; and (3) a critical reflection on open science education in Portuguese, engaging SDGs 4 and 16. This thematic breadth demonstrates the capacity of biomedical engineering students to connect technical expertise with social and environmental relevance.

Taken together, the *Coletânea* volumes are an evolving, living archive of knowledge co-created in the spirit of open pedagogy. Their value lies not only in the final product, but in the participatory, inclusive, and iterative process of their creation. This reinforces the idea that open educational practices in postgraduate education can result in high-quality scholarly resources that serve both the academy and society.

DISCUSSION

This study highlights the potential of an integrated open pedagogy approach, combining inclusive OER, AI tools, and SDG-oriented research, to transform postgraduate education in Brazil. This approach aligns with a global educational movement that seeks to reframe the role of higher education as a catalyst for social justice, innovation, and sustainability. The pedagogical framework implemented in the Graduate Program in Biomedical Engineering at UFPE enabled students to engage critically and creatively with their research topics while addressing pressing societal challenges.

The alignment of student-authored works with the Sustainable Development Goals, as documented in the *Coletânea de Estudos Teórico-Práticos na Engenharia Biomédica*, reveals the capacity of open pedagogical practices to foster socially relevant knowledge production. Such articulation strengthens the public relevance of science and supports the development of graduate education that is more responsive to both local and global demands. This contribution extends the literature on open science and inclusive education by demonstrating how postgraduate students can act as knowledge co-creators in the Global South, in a logic that breaks away from the hierarchical and transmissive view of academic knowledge.

Several challenges emerged during the implementation. Some students expressed initial apprehension toward using AI tools, fearing over-reliance or ethical pitfalls. These concerns were addressed through ongoing reflection activities and a critical approach to AI as a complementary resource rather than a replacement for human creativity. Discussions on algorithmic bias, authorship, and data transparency were incorporated into the curriculum, fostering critical AI literacy, furthermore, issues related to digital inequality surfaced, reminding educators of the need to ensure equitable access to the necessary technologies, especially in contexts marked by regional and socioeconomic asymmetries.

As reflections from students reveal growing awareness about the ethical implications of using AI tools in research. This aligns with the perspective of educators like Costa et al. (2023), who argue that digital technologies must serve human-centred pedagogies, fostering ethical agency and epistemic responsibility. Their work emphasizes the importance of "technological vigilance" in education—a critical attitude mirrored in the students' reflective essays and choices regarding open licensing and authorship. These practices resonate with the principles of technological sovereignty and science as a common good, expanding the educational role of graduate studies beyond mere technical specialization.

The multilingual and open-licensed nature of the *Coletânea* supports linguistic inclusion and epistemic diversity, countering hegemonic academic norms centred on English-language dominance; this editorial choice also stands as a political act of epistemic resistance and a recognition of students' linguistic identities. This aligns with global calls for decolonizing education and promoting diverse epistemologies (Ribeiro, 2021; Santos, 2010), promoting greater content accessibility for local communities and researchers from diverse geographic contexts.

Institutional support was crucial for the success and sustainability of the initiative. UFPE's commitment to open science principles and infrastructure, including its institutional repository and digital literacy programs, provided the necessary environment for this model to thrive. The engagement of faculty and staff was also essential to fostering a culture of collaborative pedagogical innovation, grounded in shared responsibility and mutual support.

However, scaling such pedagogical innovations requires addressing systemic challenges, including recognition of open educational outputs in postgraduate assessment criteria, faculty training, and ongoing resource investment. Collaboration with national and international networks such as the Global OER Graduate Network (GO-GN) and UNESCO's OER Dynamic Coalition can help in disseminating and refining these practices, strengthening the leadership of the Global South in the open education debate.

The experience also highlights the importance of fostering a humanistic dimension in STEM (Science, Technology, Engineering, Mathematics) education. By promoting student autonomy, critical reflection, and social engagement, open pedagogy counters the technocratic tendencies that often dominate postgraduate training. This ethical and political repositioning of the curriculum is essential for shaping academic paths that are more committed to the common good and to human rights.

In summary, this model contributes to advancing inclusive, accessible, and future-oriented academic practice in postgraduate education, with implications beyond Brazil and the field of biomedical engineering. Its replicability in other fields of knowledge and educational contexts points to a promising path toward a more just, participatory, and transformative higher education.

FINAL CONSIDERATIONS

This paper has presented a replicable open pedagogy model that integrates inclusive OER, AI tools, and alignment with the Sustainable Development Goals to enhance postgraduate research education in Brazil. Through the development of student-authored open-access publications, the approach fosters research competencies, social responsibility, and epistemic justice.

The study illustrates how digital and open educational innovations can be harnessed to address longstanding challenges in postgraduate education, including methodological difficulties, linguistic hegemony, and limited engagement with global development agendas. Moreover, it highlights the importance of repositioning graduate education as a space for knowledge production committed to the common good, epistemic diversity, and social equity.

The experience also demonstrated the strategic role of institutional support — including open science policies, digital infrastructure, and faculty development — in consolidating and sustaining innovative pedagogical practices. These elements underscore the need to rethink evaluation criteria in graduate education to value open educational products, collaborative authorship, and the social impact of research.

Future work will focus on expanding this model to other postgraduate programs and disciplines, incorporating more diverse student populations, and exploring the longitudinal impact on academic trajectories and social innovation. Engagement with international networks, such as the Global OER Graduate Network (GO-GN) and the UNESCO Dynamic Coalition on OER, represents a concrete opportunity to strengthen the leadership of the Global South in the field of open education.

By centring the human dimension of learning and promoting inclusive knowledge creation, this approach offers a pathway to more equitable and transformative higher education in the Global South, an education oriented not only toward academic excellence but also toward collective responsibility, ethical innovation, and sustainable development.

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Inclusive OER Taxonomy for Complementary and Integrative Practices in Brazil's Public Health

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ABSTRACT

This study investigates the development of a taxonomy of open educational resources (OER) as a strategic tool for training healthcare professionals in Integrative and Complementary Health Practices (PICS) within the context of the Brazilian Unified Health System (SUS). PICS, which encompass therapeutic methods focused on disease prevention, health promotion, and recovery, are formally supported by the National Policy for Integrative and Complementary Practices (PNPIC) and are offered free of charge through SUS. The objective of this work is to explore how an organized OER structure can support the ongoing education of primary healthcare professionals, promoting access to knowledge in an inclusive, participatory, and culturally relevant way. To this end, an analysis of official PNPIC and SUS policy documents was conducted, which informed the organization of OER content aligned with the principles of continuing education and the recognition of traditional knowledge systems. The results suggest that implementing an OER taxonomy can broaden access to information, promote professional development, and strengthen the principles of PICS within SUS. This approach is aligned with the Sustainable Development Goals (SDGs), especially SDG 3 (Good Health and Well-Being), SDG 4 (Quality Education), SDG 10 (Reduced Inequalities), SDG 11 (Sustainable Cities and Communities), and SDG 17 (Partnerships for the Goals). It is concluded that the proposed taxonomy represents a valuable tool for the continuous training of healthcare professionals, contributing to the dissemination of PICS and promoting accessible, inclusive, and high-quality education within public health systems.

Keywords

integrative and complementary health practices; public health; open educational resources; primary health care; traditional knowledge; participatory pedagogy; inclusive education; access to knowledge; professional development in health; healthy equity.

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INTRODUCTION

Since the 17th century, with the rise of Western scientific rationality, modern medicine has consolidated itself as the dominant model of healthcare, structured on Cartesian principles and a mechanistic understanding of the human body. While this biomedical paradigm has enabled major scientific advances, it has also contributed to a fragmented and reductionist approach to care, often marginalizing other knowledge systems and therapeutic traditions grounded in broader conceptions of life, health, and healing. From the 20th century onwards, academic research increasingly recognized the validity of other medical systems—such as Homeopathy, Ayurveda, Traditional Chinese Medicine, Anthroposophic Medicine, and diverse popular practices—which operate with their own diagnostic and therapeutic logics (Carvalho et al., 2023; Luz, 2012; Marques, 2020).

In Brazil, this recognition led to the institutionalization of Integrative and Complementary Health Practices (PICS – *Práticas Integrativas e Complementares em Saúde*), as part of a broader effort to humanize healthcare and promote more comprehensive and culturally sensitive approaches within the public health system. PICS include a wide range of therapeutic strategies based on traditional knowledge, community practices, and integrative methods that emphasize active listening, therapeutic bonding, self-care, and autonomy. These practices are grounded in a holistic understanding of health that embraces physical, mental, emotional, spiritual, social, and cultural dimensions.

The formal establishment of PICS in public policy came with the National Policy on Integrative and Complementary Practices (PNPIC – *Política Nacional de Educação Permanente em Saúde*), introduced by Ordinance No. 971/2006 of the Ministry of Health. Since then, the list of officially recognized practices has grown—currently totalling 29—including acupuncture, phytotherapy, reiki, yoga, biodanza, integrative community therapy, among others. These practices have been mainly implemented through Primary Health Care (APS – *Atenção Primária em Saúde*) settings and are aligned with the principles of health promotion, disease prevention, and integrative care (Brasil, 2014, 2018).

This movement reflects Brazil's commitment to global goals for sustainable development and inclusive healthcare. In particular, the implementation and strengthening of PICS contribute to several Sustainable Development Goals (SDGs) of the 2030 Agenda (United Nations, 2015): SDG 3 (Good Health and Well-Being): by expanding access to holistic, preventive, and culturally appropriate care options; SDG 4 (Quality Education): through the promotion of interprofessional and lifelong learning strategies in the health sector; SDG 10 (Reduced Inequalities): by valuing knowledge and practices rooted in marginalized and traditional communities, contributing to more equitable access to

healthcare; SDG 11 (Sustainable Cities and Communities): by enhancing community-based healthcare and integrating local cultural practices into public health policies; SDG 17 (Partnerships for the Goals): by fostering intersectoral and collaborative strategies for knowledge sharing and policy innovation.

Despite its growing relevance, the implementation of PICS within the Brazilian Unified Health System (SUS) faces important challenges, especially in the field of professional education. Many health workers lack adequate training to apply or refer to these practices. Structural barriers include institutional resistance, insufficient integration into service routines, lack of clear evaluation indicators, and limited availability of inclusive and accessible educational resources. These gaps hinder the broader integration of PICS into the SUS and highlight the need for more robust educational strategies.

To address these challenges, it is essential to develop open, inclusive, and culturally sensitive educational resources that support the continuous professional development of health workers. Open educational resources (OER) are a promising approach to democratize access to health education, enhance Permanent Health Education (EPS – Educação Permanente em Saúde) (Brasil, 2009) practices, and promote collaborative, context-aware learning processes. OER can offer flexible and diverse learning paths that respond to different levels of complexity and professional needs while respecting the plurality of knowledge systems present in Brazilian society.

Therefore, this study proposes the development of a taxonomy of OER focused on PICS, aimed at supporting inclusive and sustainable professional learning. This taxonomy seeks to articulate Brazil's public health policy framework, the global commitments outlined in the 2030 Agenda, and the values of equity, accessibility, and community participation in health education.

CONCEPTUAL BACKGROUND

Integrative and Complementary Health Practices (PICS)

PICS comprise a set of therapeutic approaches aimed at promoting comprehensive care, considering the human being in their entirety: body, mind, emotions, spirituality, environment, and social relationships. According to the Brazilian Ministry of Health (Brasil, 2018), PICS are based on traditional knowledge and integrative approaches, functioning complementarily to conventional medicine in health promotion, disease prevention, and quality of life improvement.

The scope of PICS within the SUS includes practices such as Acupuncture, Homeopathy, Phytotherapy, Traditional Chinese Medicine, Yoga, Reiki, Meditation, Auriculotherapy, Aromatherapy, Integrative Community Therapy, Biodanza, among others. These practices are mainly applied in APS, but also at other levels, fostering interprofessional, humanized, and comprehensive care.

The recognized benefits include the promotion of health and disease prevention through the strengthening of self-care (Hoenders et al., 2024); improved quality of life and reduction of symptoms such as anxiety, chronic pain, and stress; reduced irrational use of medications; strengthened therapeutic relationships and user autonomy; and potential integration with mental health, occupational health, and health promotion policies.

National Policy on Integrative and Complementary Health Practices (PNPIC)

The PNPIC values traditional knowledge, individual autonomy, and comprehensive care as core foundations of these practices. Among its principles and guidelines are comprehensive care; respect

for cultural diversity and ancestral/popular knowledge; health promotion and disease prevention; and the integration of PICS with conventional care, especially in APS.

In this context, the development of an inclusive taxonomy of OER for PICS is strategic. The PNPIC highlights the need for qualified and ongoing training of professionals and for ensuring that the population has access to safe and reliable information (Brasil, 2018). Therefore, an OER taxonomy must respect cultural diversity and traditional knowledge, ensure accessibility, use open licenses, foster interprofessional education, and encourage community participation.

This proposal aims to contribute to the democratization of knowledge and the implementation of PNPIC guidelines (Brasil, 2014, 2018), supporting the strengthening of PICS within the SUS and helping to achieve Sustainable Development Goals (SDGs) 3 (Good Health and Well-being), 4 (Quality Education), 10 (Reduced Inequalities), 11 (Sustainable Cities and Communities), and 17 (Partnerships for the Goals).

Access to Information, Professional Training, and Health Equity

Access to quality information and the continuous training of healthcare professionals are essential conditions for consolidating PICS as an integral and effective part of the SUS. However, studies and official reports such as Brasil (2018) and (2024) reveal significant gaps in professional qualification, in the production and circulation of reliable and accessible educational materials, as well as in the integration among services, managers, and users.

These gaps directly affect health equity, as the lack of knowledge or misinformation about PICS undermines their availability and adoption, especially among populations in vulnerable situations. Therefore, it is essential to invest in strategies that promote universal, inclusive, and context-sensitive access to educational and informational content.

The equity perspective requires considering factors such as gender, race, territory, age, disability, and other social markers that influence access to care and knowledge. An intersectional and territorialized approach to training can promote fairer practices that are sensitive to the cultural and social specificities of individuals and communities.

OER and Their Applicability to PICS

OER are teaching, learning, and research materials available in any medium or format that are either in the public domain or released under an open license, allowing free use, adaptation, and redistribution by others. The concept of OER is aligned with the principles of open education, knowledge as a common good, and digital inclusion.

In the context of PICS, OER provide a strategic opportunity to democratize access to information and training, support the collective construction of knowledge, and valorize traditional and popular knowledge systems. When developed with open licenses, communicational accessibility, and cultural sensitivity, OER can contribute to interprofessional training and the empowerment of users and communities.

Furthermore, the integration of OER and digital technologies allows for greater reach and customization of educational processes, supporting the creation of collaborative networks and

strengthening local health care initiatives. As such, OER can serve as tools for the effective implementation of the PNPIC and for achieving SDGs 3, 4, 10, 11, and 17.

The following sections present the methodological proposal for constructing a taxonomy of OER applicable to PICS, based on principles of accessibility, inclusion, cultural diversity, and participation.

Permanent Health Education and Social Participation

Permanent Health Education (EPS) is a strategic policy of the SUS aimed at transforming professional practices and enhancing the qualification of health workers through problematization of everyday service experiences and the valorization of local knowledge. Based on a critical-reflective approach, EPS promotes continuous educational processes connected to territorial needs and the concrete experiences of teams and communities.

In the field of PICS, EPS plays a vital role as it enables the contextualized incorporation of integrative practices, respecting the diversity of knowledge systems and fostering dialogue among different medical rationalities. Training should not merely be transmissive but rather experiential, collaborative, and place-based—capable of strengthening healthcare through engagement with local realities.

Social participation, in turn, is one of the guiding principles of the SUS and a foundational element of health policy. In the context of PICS, active listening to communities, users, and workers helps identify needs, value popular practices, and collectively build care solutions. The integration of EPS and social participation strengthens individual and collective autonomy and contributes to the democratization of public health policies.

Integrating the EPS perspective into the development of an OER taxonomy for PICS means recognizing learners as active agents in the educational process and valuing diversity as a core element of health education. This approach expands the transformative potential of OER by connecting them to the principles of popular education, interprofessional collaboration, and social justice.

Existing Taxonomies or Frameworks for OER in the Health Field

Building an inclusive taxonomy of OER for PICS within the SUS requires a critical analysis of established classification systems in health education, open learning, and integrative health policies. This analysis guides the creation of categories that address pedagogical, technical, cultural, and political needs in public health training processes.

Bloom's Taxonomy, originally proposed in 1956 and revised by Anderson and Krathwohl (2001), classifies learning objectives by cognitive complexity: remember, understand, apply, analyze, evaluate, and create. Its application in the PICS context enables the development of learning goals ranging from initial awareness to reflective and critical practice, supporting training aligned with comprehensive care.

The International Classification of Traditional Medicine (WHO, 2010) aims to map and standardize integrative practices considering their global diversity. It provides essential insights for organizing PICS within the SUS, facilitating the categorization of recognized knowledge and practices and standardizing educational content for professionals and users.

UNESCO's OER taxonomy (2021) proposes categories such as: Type of resource (text, video, audio, interactive multimedia); Licensing and openness (Creative Commons, public domain); Technical format and accessibility (compliance with digital accessibility standards).

These categories are fundamental for guiding the production, curation, and dissemination of OER applicable to PICS, ensuring inclusion, adaptability, and reusability.

The Brazilian Ministry of Education's National Catalogue of Technical Courses is structured around professional fields and educational pathways. Its application to PICS allows for the mapping of technical training needs and the identification of professional profiles related to integrative practices within the SUS.

The UNA-SUS Network Educational Resources Catalogue (UNA-SUS) organizes OER by health themes, educational objectives, target audience, delivery modality (in-person, distance, hybrid), and media type. This practical and consolidated taxonomy can be adapted to the specificities of PICS in health education contexts.

Thus, a proposed inclusive taxonomy for PICS should combine pedagogical, technical, and cultural categories, upholding principles of accessibility, cultural relevance, practice diversity, and territoriality. It should also address different levels of educational complexity—from introductory to specialized—and promote the integration of traditional knowledge, evidence-based practices, and community participation.

METHODOLOGICAL APPROACH

Research Design and Nature

This study adopts a qualitative, applied, and exploratory research design, grounded in the theoretical-methodological principles of critical epistemologies and participatory approaches in health education. The central objective is to develop an inclusive taxonomy of OER aimed at the continuous and interprofessional training in PIC) within the SUS.

Given the complexity and plural nature of PICS—anchored in diverse knowledge systems, cultural traditions, and care practices—the choice of a flexible and participatory approach is justified. It favors dialogical, inclusive, and reflexive construction processes, aligned with the principles of Popular Education and Permanent Health Education.

Sources and Document Corpus

The construction of the taxonomy is based on a documentary corpus composed of normative, institutional, and conceptual references considered fundamental for understanding the field of PICS and its intersection with OERs. These sources include:

- ARES Platform and Educational Resources Catalog (UNA-SUS).
- PNPIC – National Policy of Integrative and Complementary Practices in Health (Brasil, 2018).
- WHO – World Health Organization documents on Traditional Medicine and Integrative Health (WHO, 2010, 2025).
- ObservaPICS and MonitoraPICS Reports (Brasil, 2024; Fiocruz, n.d).
- UNESCO – Recommendations and frameworks on Open Educational Resources (2017; 2021).
- MEC/INEP – National Catalog of Technical Courses and educational classification systems.

- Academic literature on PICS, health education, taxonomies, and digital inclusion, (Ho et al., 2021; Ignatti & Nakamura, 2021; Morin, 2020; Santos & Brasil, 2022; Silva, 2022; Silveira & Rocha, 2020; Tesser et al., 2028).

These documents were selected based on their relevance, officiality, and recurrence in national and international debates. The comparative analysis of their content guided the identification of criteria and dimensions for taxonomy construction.

Analytical Procedures

The analysis process involved several interconnected steps. First, document selection and systematization were carried out through the organization of the corpus by type of source—normative, conceptual, or pedagogical—and by level of action, whether national, international, or institutional. This was followed by content mapping, which focused on identifying key concepts, classifications, categories, and descriptors used in each document regarding PICS and OER. Subsequently, thematic coding was performed to group the information according to thematic axes, such as types of practices, educational objectives, intended audience, levels of complexity, accessibility, and cultural relevance.

A comparative analysis was then conducted to cross-reference these thematic axes and to identify convergences, divergences, and existing gaps among the documents. Finally, a preliminary taxonomy was formulated, integrating pedagogical, technical, and cultural dimensions. Throughout this process, analytical procedures were supported by qualitative data analysis tools, including spreadsheets and thematic matrices, which facilitated the synthesis and visualization of the relationships among the mapped categories.

Participatory and Inclusive Validation

To ensure the relevance and applicability of the proposed taxonomy, participatory validation activities are planned with actors involved in PICS and open education. These include:

- Health professionals and managers working in the implementation of PICS in the SUS.
- Educators and researchers in the fields of health education, integrative medicine, and digital education.
- Members of traditional communities and users of PICS, as co-producers of knowledge and practices.

Validation will occur through discussion groups, online consultation, and collaborative prototyping dynamics, aiming to incorporate different perspectives and adjust the taxonomy to real demands of formation, access, and use of OER in the field of PICS.

This participatory process aligns with the ethical commitment to social inclusion and equity in the production of educational technologies, recognizing the diversity of knowledge and actors involved in integrative health care.

Ethical Considerations

Although the present study is primarily documentary and exploratory in nature, the subsequent stages involving participatory validation will be submitted to the Research Ethics Committee (CEP – Comitê de Ética em Pesquisa) in accordance with Brazilian regulations (Brasil, 2016).

The research is guided by principles of respect for cultural diversity, appreciation of traditional knowledge, and protection of the rights of the individuals and communities involved. The open and inclusive nature of the proposed OER taxonomy reinforces the commitment to transparency, co-responsibility, and the democratization of access to knowledge.

RESULTS

Overview Of Policy Document Insights

The documentary analysis of national health and education policies, with a focus on the National Policy on Integrative and Complementary Practices (PNPIC) and the guidelines of the Unified Health System (SUS), reveals key elements for understanding the PICS into educational processes and for designing an inclusive taxonomy of OER.

Table 1. Key Documents for Taxonomy Development

Document	Scope	Focus Areas	Relevance to Taxonomy
Portaria GM/MS nº 971/2006 (Brazil)	National policy (Brazil)	Legal framework, recognition of PICS, guiding principles	Establishes the legal basis and initial set of recognized PICS within the SUS
Report (2024) – Fiocruz / PAHO	Regional (Americas and the Caribbean)	Diversity of practices, intercultural health, national frameworks	Highlights sociocultural diversity and supports context-sensitive categorization of practices
PICS Report (2024) – Brazilian Ministry of Health	National monitoring (Brazil)	Health information systems, implementation data, regional disparities	Provides empirical evidence for territorial mapping and service availability
WHO Traditional Medicine Global Report (2025)	Global	Policy, regulation, research, education, integration strategies	Offers international frameworks and terminology aligned with global health standards

The document analysis revealed the presence of a consistent normative and institutional foundation, but also exposed key challenges such as training gaps, territorial fragmentation, and the limited integration between traditional and biomedical knowledge systems. These findings underscore the need for a taxonomy that is both standardized and culturally/contextually sensitive. The following section presents the proposed categorization, informed by the criteria derived from this documentary evidence.

Public policy insights indicate that the analyzed policies reinforce the role of PICS as complementary and integrative practices embedded in SUS healthcare, particularly in APS. The PNPIC recognizes cultural diversity and traditional knowledge as legitimate components of care and health education. SUS and the PNEPS emphasize in-service education and collaborative learning as strategies for continuous professional development. Public policies highlight equity, universal access, and the

humanization of care, which also guide education in PICS. Strengthening PICS in SUS requires technical, scientific, and culturally sensitive training, enhancing their role in comprehensive care and health promotion.

Key elements identified in PNPIC and SUS regarding PICS education include:

- Comprehensive and Humanized Care: PICS are recognized as practices that broaden the comprehensive view of care within SUS, integrating body, mind, and social context (Brasil, 2018).
- Valuation of Traditional and Popular Knowledge: Encouragement of integrating traditional knowledge into training and care practices, respecting cultural diversity (Brasil, 2024).
- Continuing Education in Health (ECS – Educação Continuada na Saúde): Recognition of ECS as a structural axis for health education and the qualification of PICS offerings in SUS (Brasil, 2009; Brasil, 2014).
- Social Participation and Community Engagement: Communities are seen as key agents in care construction and educational actions (Brasil, 2018).
- Health Promotion and Autonomy: PICS are linked to health promotion and the empowerment of users and professionals (Brasil, 2014).
- Equity and Access: Policies reaffirm the commitment to equitable access to PICS training and practice across all territories and populations (Brasil, 2009).

In summary, the policies analyzed emphasize that PICS education in SUS must be grounded in cultural inclusion and lifelong learning. Professional training in PICS should engage with cultural diversity, social rights, and the value of traditional knowledge. The proposed inclusive OER taxonomy must reflect these principles, organizing educational content that is open, accessible, participatory, and aligned with current public policies.

Structure of the Proposed Taxonomy

The proposed taxonomy of Inclusive OER for PICS aims to organize educational content in an accessible and culturally relevant way, aligning with the educational needs of health professionals, managers, and communities within SUS.

Its structure encompasses pedagogical, technical, and contextual categories, providing a clear and flexible classification to guide the production, curation, and use of OER.

Categories and Subcategories of OER Relevant to PICS Training

- Awareness and Introduction to PICS: Introductory content on PICS foundations, policies, and principles; emphasis on awareness and critical reflection.
- Technical-Scientific Deepening: Studies of specific practices (e.g., phytotherapy, acupuncture, meditation); technical principles, scientific foundations, and health evidence.
- Professional Practice and Application in SUS: Protocols, case studies, field experiences; guidelines for integrating PICS in Primary Health Care and other levels.
- Community and Popular Education: Materials for users, community leaders, and outreach activities; traditional knowledge and cultural practices.

The OER developed encompass a wide range of formats, target audiences, thematic axes, and levels of complexity, aiming to address the multiple dimensions of professional education in PICS.

OER formats include didactic texts such as booklets, manuals, articles, and practical guides; videos and audiovisual materials, including lectures, tutorials, and experience reports; audio and podcasts featuring interviews, testimonials, and practical guidance; interactive and multimedia objects such as infographics, educational games, simulations, and quizzes; as well as accessible materials incorporating sign language, audio description, plain language, and formats adapted to diverse needs.

The target audience comprises health professionals engaged in technical training, scientific updates, and clinical practice improvement; students and residents in initial education, internships, and residency programs; health managers and coordinators involved in policy development and service management; and the broader community and SUS users, with a focus on health education, self-care, and health promotion.

The content is organized around thematic axes that include the conceptual and policy foundations of PICS; therapeutic practices and specific techniques; approaches to integral health and health promotion; cultural diversity and popular knowledge; as well as continuing education and professional development.

Regarding levels of complexity, the materials are designed to support learning at various stages, from initiation and awareness-raising, through intermediate and continuing education, to advanced and specialized training, including multiprofessional and community-oriented approaches.

The overall structure of the OER is synthesized into four key categories of learning objects: introductory content, conceptual deepening, application in professional practice, and resources for community education. These materials are presented across multiple formats (text, video, audio, interactive, and accessible), directed to diverse audiences (professionals, students, managers, and the community), organized by thematic areas (PICS, integral health, diversity, and continuing education), and tailored to different complexity levels (introductory, intermediate, and advanced).

Description of Each Category (Thematic Areas, Formats, Pedagogical Approaches)

These categories form the structural foundation of the inclusive OER taxonomy designed to guide the organization, production, and evaluation of educational content for training in PICS within SUS.

Thematic areas, or formative axes, define the core content addressed by the educational resources, considering the intersections between professional practice, public policy, and cultural diversity. This includes the foundations of PICS and related public policies, such as their historical background, conceptual bases, legal regulation, and the guidelines set by the PNPIC. It also involves therapeutic practices, which cover specific techniques like phytotherapy, homeopathy, acupuncture, body practices, meditation, aromatherapy, and community therapy. Another key area is health promotion and self-care, focusing on how PICS contribute to quality of life and integrative healthcare. Traditional knowledge and cultural diversity are equally emphasized, highlighting popular and ancestral practices and reinforcing the importance of respecting ethnic and cultural diversity. Lastly, continuing education and professional development are considered, with a focus on methodologies for lifelong learning, in-service education, and collaborative practices.

The formats of the OER refer to the type of media and educational support used, which are critical for ensuring accessibility and fostering pedagogical diversity. These include didactic texts such as booklets, articles, guides, manuals, and lesson plans; videos and audiovisual materials including recorded lectures, documentaries, demonstrations, and interviews; and audio resources such as podcasts featuring experience reports, debates, guidance, and reflections. Interactive digital objects, such as infographics, educational games, animations, quizzes, and simulators, offer dynamic and engaging learning experiences. Additionally, accessible materials are incorporated to ensure inclusivity, such as resources with captions, sign language interpretation, audio descriptions, and plain language versions.

Pedagogical approaches play a vital role in shaping the educational intent of each resource and are carefully chosen to promote critical, reflective, and participatory learning. These include dialogical and participatory pedagogy inspired by Paulo Freire (2021), which values dialogue, knowledge exchange, and learner protagonism; active methodologies, such as problem-based learning, case studies, and collaborative projects; and popular health education, which emphasizes community knowledge and collective learning. The approach of ECS also informs this structure, focusing on in-service training and fostering reflective and transformative professional practices.

The taxonomy also defines target audiences to ensure that both the content and the strategies are appropriately directed. It addresses health professionals working across various roles in SUS; students and residents engaged in technical, undergraduate, and postgraduate training; managers and coordinators responsible for decision-making and program implementation; and members of the community, including SUS users, grassroots leaders, and social movement participants.

Finally, the taxonomy classifies OER content according to different levels of complexity, aligned with the depth of information and the purpose of training. These levels include initiation and awareness, offering an introduction to key concepts, policies, and practices; intermediate or continuing education, which provides theoretical and practical deepening often through case studies; advanced or specialization, focusing on technical and scientific expertise for clinical and specialized practices; and multiprofessional or community-based training, aimed at developing cross-cutting competencies within health teams and territories.

Alignment With the Principles of Continuing Education

The development of an Inclusive OER Taxonomy for training in Integrative and Complementary Health Practices aligns directly with the principles of ECS, Continuing Education, and Open Education, consolidating itself as a support tool for lifelong learning and for strengthening more humanized and inclusive educational practices in SUS.

How the Taxonomy Supports Lifelong Learning, Participatory Pedagogy, and Recognition of Traditional Knowledge

The taxonomy encompasses different levels of formative complexity, ranging from initiation to advanced specialization, and enables continuous access to knowledge according to the diverse needs of professionals and communities. It fosters learner autonomy and encourages active participation in the construction of knowledge, offering relevant content at various stages of the professional journey. By aligning with the principles of the PNEPS, it supports in-service training that integrates everyday professional practice with educational processes.

A key feature of the taxonomy is its integration with participatory pedagogical approaches. It places emphasis on dialogical and experience-based learning, valuing the active role of learners and their prior knowledge. The structure promotes educational strategies grounded in active methodologies such as problem-based learning, collaborative discussions, and popular health education. Through these approaches, it stimulates the co-construction of knowledge among professionals, users, and communities, reinforcing the collective and democratic essence of health education within SUS.

Equally significant is the recognition of traditional and popular knowledge. By including the thematic axis of “Traditional Knowledge and Cultural Diversity,” the taxonomy affirms its commitment to honouring cultural and community-based practices. It acknowledges ancestral and local knowledge as essential components of holistic care and professional development, in full alignment with the principles of the PNPIIC. This inclusive perspective also encourages the creation and dissemination of culturally relevant educational resources, promoting intercultural dialogue and the appreciation of Brazil's rich sociocultural diversity.

More than a framework for organizing content, the proposed taxonomy serves as a comprehensive educational instrument. It advances lifelong professional development, reinforces participatory and emancipatory pedagogical practices, and legitimizes traditional and community-based knowledge as integral to health education and care within SUS.

Potential Impact on Accessibility and Inclusion

One of the core goals of the proposed Inclusive OER Taxonomy for PICS within the SUS is to expand access to knowledge by addressing structural, pedagogical, and cultural barriers that have historically limited the continuing education of health professionals, communities, and system users.

To tackle technological barriers, the taxonomy promotes the development of educational resources in diverse formats and across multiple platforms, including low-cost and accessible digital materials, thereby helping to reduce digital exclusion. In terms of pedagogical barriers, it encourages participatory and inclusive methodologies that go beyond information delivery, ensuring that educational content is meaningful and aligned with the lived experiences of learners.

Cultural barriers are addressed through the recognition and valorization of traditional knowledge and community practices, challenging epistemological biases and embracing diverse knowledge systems present across different territories. The taxonomy also considers linguistic and communicational barriers by promoting the use of simple, accessible, and non-discriminatory language, while supporting the creation of adapted materials such as sign language interpretation, audio description, and culturally sensitive translations.

Promoting democratized access to education is a guiding principle of this taxonomy. It encourages the adoption of open licenses, such as Creative Commons (2022), to facilitate the free sharing, adaptation, and redistribution of educational resources, thereby amplifying their reach and social relevance. The taxonomy also supports collaborative and participatory content development, involving health professionals, educators, community members, and users in the co-creation process. This not only democratizes access to educational content but also promotes a shared sense of authorship and collective ownership of knowledge.

By including the community as a central audience, the taxonomy strengthens support for popular health education and fosters the exchange of knowledge and practices that empower individuals and reinforce health citizenship. The expected impacts of this approach include the reduction of educational inequities, as adaptable and accessible OERs enable professionals from diverse regions and social backgrounds to engage in ongoing education. It also contributes to the strengthening of health teams, particularly through the emphasis on cultural diversity and the inclusion of traditional health practices, reinforcing SUS's commitment to equity and comprehensive care.

Furthermore, the taxonomy encourages educational innovation by supporting pedagogical approaches that are responsive to local realities and open to intercultural dialogue. In doing so, it not only organizes educational content effectively but also promotes the democratization of knowledge itself. Ultimately, this initiative expands the right to training and comprehensive healthcare for professionals, managers, communities, and users across the SUS network.

DISCUSSION

The analysis of documents, public policies, and pedagogical frameworks demonstrates that the construction of an Inclusive OER taxonomy focused on PICS represents a strategic advancement both for professional training within the SUS and for the democratic expansion of access to health knowledge. The proposed taxonomy aligns with the guidelines of the PNEPS, by facilitating the organization, access, and appropriation of educational resources by professionals operating at different levels of the SUS.

Interpretation of the Results

The structure of the taxonomy facilitates continuous and on-the-job training, allowing health workers—even in peripheral contexts or with limited resources—to access content appropriate to their level of practice and learning needs. By promoting autonomy and critical learning, the variety of suggested pedagogical approaches encourages critical reflection and professional protagonism, strengthening evidence-based practices and dialogue with communities.

The taxonomy also fosters multiprofessional and community integration by valuing interconnectivity and traditional knowledge, leading to more integrated, collaborative, and person-centered care, and promoting teamwork within the SUS.

Support for pedagogical innovation is also highlighted, as the taxonomy provides a reference that can guide training programs, curricula, and pedagogical projects, enhancing participatory methodologies and the strategic use of educational technologies.

Benefits of Disseminating Integrative Health Practices

The dissemination of PICS through accessible, culturally sensitive, and pedagogically appropriate OER offers multiple benefits to the health system and society at large. By strengthening health promotion and self-care, PICS reinforce prevention strategies fundamental to Primary Care and aligned with SUS's comprehensive care model. Through the valorization of cultural diversity and local knowledge, integrative practices support the recognition of traditional knowledge and folk medicine as legitimate forms of care. Expansion of access to knowledge and training through inclusive OER increases reach, reduces access barriers, and promotes health equity. Finally, the strengthening of care and knowledge networks is facilitated by the collaborative nature of OER use, promoting exchanges between

professionals, services, communities, and training institutions—thus reinforcing the principle of integrality.

Comparison With Other OER Frameworks

The proposed taxonomy of Inclusive OER for PICS within the SUS builds upon and dialogues with established models of OER classification and organization, such as those promoted by UNESCO (2017, 2021). The taxonomy stands out for its focus on inclusion and accessibility—unlike many conventional taxonomies, it introduces explicit categories addressing inclusion, cultural diversity, and accessibility, aligned with human rights and the principles of the SUS. Its integration with public health policy—by aligning directly with PNPIC, PNEPS, and SUS guidelines—makes the taxonomy responsive to the actual needs of the SUS.

Recognition of traditional and local knowledge as core categories is uncommon in international models, making this a context-specific and ethical differentiator. The articulation between professional and community education is another distinction: while other frameworks often emphasize only technical or academic training, this taxonomy envisions materials for both professional development and community-based education. Its flexibility and practical application allow it to be adapted to various educational contexts—from formal teaching to popular education and community health initiatives.

On the other hand, the taxonomy faces certain limitations compared to existing models:

- Lack of detailed technical standards: Unlike OER Commons, which includes detailed metadata and technical descriptors such as interoperability and digital formats, this taxonomy does not yet present a standardized technical protocol for indexing.
- Thematic focus: As it is designed for PICS and the SUS, its application may be limited outside the health education domain or in international settings.
- Need for digital validation: The taxonomy still requires testing within virtual learning environments and digital repositories to assess its effectiveness in content curation and retrieval.
- Dependence on continuous updating: Given the evolving nature of health practices and policies, the taxonomy will need regular updates to remain relevant.

Despite these limitations, the taxonomy stands out for its commitment to inclusion, cultural diversity, and the strengthening of the SUS, offering a significant contribution to education in integrative practices and public health. While it may not offer the same level of technical refinement as other models, it introduces an innovative approach to OER classification in the PICS field and may inspire revisions of conventional frameworks toward more inclusive, context-sensitive perspectives.

Challenges and Limitations

Although the taxonomy of Inclusive OER for PICS in the SUS represents progress in organizing and democratizing educational resources in health, its implementation and broader application face structural, technical, and sociocultural challenges.

Technical and operational challenges include:

- Lack of unified technical standards: The absence of consolidated standards (metadata, indexing, interoperability) may hinder integration with existing national and international OER platforms.
- Limited technological infrastructure: In many regions of Brazil, especially rural or traditional communities, precarious infrastructure (internet access, devices) may limit the use of digital OER.
- Need for training content producers: Effective application depends on the training of health professionals, educators, and managers in the creation, curation, and critical use of OER—requiring investment in PICS and SUS specific education.
- Thematic specificity: Being focused on PICS and SUS, the taxonomy may not be easily generalizable to other educational domains or international health systems without significant adaptation.
- Ongoing maintenance: The dynamic nature of health practices and public policies demands periodic updates, requiring dedicated human and financial resources.
- Dependence on practical evaluation: Its large-scale application still needs to be tested in real training contexts and digital repositories—an essential step before consolidation.

Implementation must consider technical, cultural, and institutional barriers. The success of the taxonomy depends on the coordination of public policies, professional development efforts, and the engagement of SUS-based training communities.

Potential constraints to the implementation or broader generalization of this initiative include institutional and cultural resistance, as PICS still face opposition in some academic and institutional contexts, which can hinder their integration into official training programs. Additionally, Brazil's vast regional and cultural diversity presents a challenge for standardization, as it necessitates ongoing adaptation to ensure that educational materials remain locally relevant and culturally sensitive. Another significant limitation lies in the fragility of open education policies; although there have been recent advances, the country still lacks consistent and robust policy frameworks to systematically support the production and dissemination of OER in the health sector.

Recommendations For Practice and Policy

Consolidating the taxonomy of Inclusive OER for training in PICS within the SUS requires articulation among public policies, pedagogical practices, and institutional strategies. The following recommendations aim to support its incorporation into continuing education programs and to strengthen the development of inclusive educational resources.

To effectively incorporate the proposed taxonomy into SUS continuing education programs, several strategies can be pursued in an integrated and articulated manner. One key step is to include the taxonomy in ECS, ensuring that it is embedded in the guiding documents of regional and national PEPS, where it can serve as a reference for the production, curation, and evaluation of educational resources. Strategic partnerships with public health schools, technical education institutions, universities, and the Ministry of Health are also essential for integrating the taxonomy into pedagogical projects and training initiatives, fostering coherence across different levels of professional education. In addition, the taxonomy can be implemented within official digital repositories and virtual learning environments

for health education, supporting its practical application through courses, structured learning pathways, and curated digital collections. To support widespread adoption and meaningful use, it is also important to invest in training educators and health managers by offering workshops, courses, and seminars that promote familiarity with the taxonomy and develop competencies in organizing and producing OER aligned with its structure and principles.

Promoting the development of inclusive OER requires the implementation of integrated strategies that foster collaboration, accessibility, and cultural relevance. One important approach is to support public calls and fund collaborative projects focused on the production of inclusive and accessible OER, engaging health professionals, educators, users, and traditional communities in the co-creation process. Encouraging the adoption of open licensing policies, such as Creative Commons (2022), is also essential to guarantee the free access, adaptation, and redistribution of educational materials. Ensuring accessibility and cultural diversity must be a central concern, with mandatory criteria incorporated into resource development and curation, including Brazilian Sign Language (Libras), audio description, plain language, and the representation of diverse cultural contexts. Establishing institutional networks for sharing OER, pedagogical practices, and successful training experiences in PICS can further strengthen the collaborative ecosystem. Additionally, implementing participatory evaluation mechanisms involving SUS professionals, users, and experts can help assess the pedagogical quality, accessibility, and cultural adequacy of resources, ensuring they meet the diverse needs of learners across the health system.

The integration of the Inclusive OER taxonomy into SUS continuing education programs, along with strategies to develop accessible and culturally sensitive educational resources, can enhance the democratization of health knowledge, broaden the reach of integrative practices, and consolidate the SUS's commitment to equity, inclusion, and the appreciation of community-based knowledge.

FINAL CONSIDERATIONS

The development of the Inclusive OER Taxonomy for PICS within the SUS represents a strategic contribution to strengthening integrative health education and promoting equity and inclusion in professional training.

The taxonomy offers criteria and categories that organize and guide the production, curation, and use of OER for training in PICS, respecting cultural, regional, and pedagogical specificities. It fosters the integration of traditional and scientific knowledge, valuing popular and ancestral practices within the context of comprehensive health care. It promotes participatory and inclusive educational practices, supports dialogical methodologies, lifelong learning, and in-service training. As such, it broadens access to quality educational resources, democratizes knowledge, and encourages the autonomy of professionals and communities.

This framework represents an invitation to reflection, pedagogical innovation, and social commitment to health education. By integrating principles of inclusion, accessibility, and cultural diversity, it reaffirms the role of OER as agents of educational and social transformation, essential to strengthening SUS, advancing integrative practices, and promoting health equity in Brazil.

When designed from an inclusive perspective and guided by a taxonomy sensitive to integrative practices, OER become essential tools for continuous professional development. Adaptable to different training contexts and levels of complexity, OER serve as instruments to reduce inequalities in access to

information and knowledge, thereby contributing to health equity and the strengthening of primary care within SUS.

Moreover, OER function as mechanisms for valuing local practices and community knowledge, bringing professionals, users, and managers together in a collective, transformative educational process rooted in the lived experiences of territories.

To expand the impact and applicability of the taxonomy, several future directions are highlighted: applied research to validate and refine the taxonomy in diverse regional contexts; studies on its impact on professional training and lifelong education processes in the SUS; and the development of digital tools and thematic repositories that adopt the taxonomy as a reference.

Consolidating this proposal also requires strengthening public policies on open education, inclusion, and training in integrative health practices. Building collaborative networks among educational institutions, health services, and communities is fundamental to fostering co-production and sharing of OER, ensuring their relevance, legitimacy, and sustainability.

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Posthumanism and Open Education Philosophies in ODeL: Intersections, Tensions, and Embodied Pedagogies: A Scoping Review

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ABSTRACT

The philosophical underpinnings of research in Open and Distance e-Learning (ODeL) remain deeply rooted in a humanist ontology, where the exclusionary construct of anthropos (human) poses limitations for social justice and equity. This paper examines the possibilities and constraints that a posthumanist ontological stance may offer in re-envisioning openness and justice, not only within the context of South African ODeL practices, but also on a global level. Accordingly, this paper brings into dialogue posthumanist philosophy, embodied learning theory, and South African ODeL practices. This discussion necessitates critical reflection on concepts aligning with Ako, including Ubuntu, social injustices rooted in mind-body dualism, eco-injustices resulting from anthropocentrism, and knowledge de/colonisation. Engaging with these concepts emphasises the relationality, reciprocity, and interconnectedness needed to push the boundaries of conventional teaching and learning in ways that improve the quality, openness, student-centredness and inclusivity of ODeL practices.

This paper presents the findings of a scoping review of existing research on the intersections between posthumanist philosophy and open education philosophy within ODeL pedagogy. The scoping review maps the conceptual landscape of embodied learning, ODeL, social justice, and eco-justice within South African open and distance education research. Based on this review, the paper outlines key findings and recommendations for change at a philosophical level, as well as the anticipated practical implications for ODeL practices. The scoping review includes peer-reviewed articles, book chapters, conference papers, and grey literature published between 2014 and 2025.¹

Keywords

posthumanism; openness; embodied learning; open and distance e-learning; ubuntu; ethics of entanglement; eco-justice; decolonisation; human-more-than-human relations; educational equity

¹ The original scope of the review was limited to 2014–2024. This was expanded to include publications from 2014 to 2025 in order to capture the most current research available at the time of the review.

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INTRODUCTION

Open and Distance e-Learning (ODeL) frameworks have long sought to promote greater social justice and the democratisation of knowledge. In the South African context, openness in education is framed around increasing access, reducing cost, and removing barriers of time and geography (Akintolu & Letseka, 2024; Farrow, 2017). However, despite these ambitions, much of the field remains grounded in mind–body dualism (Cartesian) and humanist philosophical legacies, both of which have historically excluded certain bodies and reinforced inequality.

Openness is often associated with liberalist ideology and the principles articulated by John Dewey, aimed at enhancing participation and equality, embracing pluralism, and promoting student autonomy (Sakkoula & Lionarakis, 2024). However, when viewed through a philosophical, existential, critical posthumanist lens, current ODeL practices appear to operate on humanist assumptions that are fundamentally contradictory to the aims of open education philosophies.

Posthumanist philosophy challenges anthropocentrism by decentring the ‘human’ and promoting an ethics of entanglement. This philosophical stance questions the very mechanisms of social ordering that produce exclusion, rejecting the idealised, autonomous, rational learner figure that dominates ODeL pedagogies (Knox, 2015; Postma, 2016). While some critique the decentring of the human as neglecting social justice, posthumanism offers the notion of becoming-minoritarian—reclaiming space for marginalised or non-normative subjectivities by disrupting dominant social orders (Postma, 2016). One of our central arguments in a previous conference paper is that inequalities will continue to exist and reproduce for as long as educational systems and practices build on humanist assumptions of the rational, autonomous, neoliberal subject.

Current open education practices often operate on humanist assumptions in four key ways:

1. Maintaining the assumption of a disembodied, autonomous learner. ODeL approaches maintain the assumption of a disembodied, autonomous learner, influenced by Descartes’ mind/body dualism that separates the mind from the physical body (Zhang, 2022). This dualism is implicit in further distinctions between subject/object, self/other, human/technology, treating the learner as disembodied and rational, i.e. a learner disconnected from their material and discursive contexts (Bayne, 2016; Gourlay, 2021; Zhang, 2022).
2. Privileging the cognitive capacity of the human learner as the knowing subject, separate from an external, knowable world. ODeL tends to privilege the cognitive capacity of the human learner as the knowing subject, separate from an external, knowable world (Gourlay, 2021; Knox, 2015).

3. Assuming a universal human subject and condition, which risks perpetuating inequality. ODeL platforms, like MOOCs, tend to assume a universal human subject and human condition, which creates conditions for inequality and lead to the need for decolonising education (Knox, 2015).
4. Situating technology as subservient to the human subject, rather than recognising it as agential and entangled in learning processes. a humanist view situates technology as subservient, as a tool separate from the human subject (Knox, 2015).

From a posthumanist perspective, openness should be reimagined as more than access, flexibility, or affordability. It should acknowledge the entanglement of human and more-than-human agents (Barad, 2007), including technology, matter, and environments, in co-constituting learning. As such, the perspective of a posthuman ethics of entanglement invites a shift in pedagogical design—from content delivery toward creating learning ecologies that are responsive, open-ended, and ethically attuned. More-than-human entanglement is always material—rooted in the body's sensory, affective, and cognitive relations with both organic and technological actants—making embodiment an inevitable site of pedagogical concern.

Embodied learning principles offer further potential for transformation. Rather than reducing learning to cognitive activity, embodied learning recognises the bodymind as affective, sensory, relational, and socio-materially situated (Bayne, 2004; Knox, 2015; Munro, 2018). Integrating embodied learning into posthumanist-informed openness foregrounds learners as complex, entangled beings whose engagement is shaped by both their physical presence and their relational embeddedness in more-than-human networks.

In South Africa, this intersection between posthumanism, openness, and embodied learning can be enriched through Ubuntu philosophy. Traditionally centred on human-to-human relationships, Ubuntu emphasises relationality, interdependence, and care (Ngubane-Mokiwa, 2016). When extended to include the more-than-human, Ubuntu aligns with posthumanist ethics of entanglement and opens possibilities for eco-justice-oriented educational practices.

This paper forms part of a larger research trajectory that began with a conceptual exploration of these intersections, presented at the Eleventh Pan-Commonwealth Forum on Open Learning (PCF11), and now turns toward empirical mapping through a scoping review. The aim is to identify how existing scholarship engages with the concepts of openness in education, posthumanist ontology, and embodied learning, to highlight gaps and explore opportunities for rethinking ODeL pedagogies in ways that are posthumanist-informed, Ubuntu-aligned, and embodied. In doing so, this paper offers conceptual and pedagogical insights for reimagining inclusive, scalable, and sustainable higher education. Aligning with *ako*, this scoping review foregrounds entangled and reciprocal human-more-than-human relations in ODeL, it addresses equity and accessibility of education through critical engagement with the concept of 'openness' in a posthumanist sense, and explores embodied and relational approaches to digital, distance education that does not reduce technology to an instrument and the student as a solely cognitive entity.

CONCEPTUAL GROUNDING

Posthumanism

Critiques of posthumanism often claim that decentring the human is problematic at a time when many are still struggling for recognition as human (Gourlay, 2021). This interpretation, however,

misrepresents the intent of posthumanist thought. To move the human from the centre is not to abandon social justice; rather, it is to reject human exceptionalism and the idea of the “ideal” human subject. Historically, the human (*anthropos*) placed at the centre of knowledge and culture has typically been a white, heteronormative, European, wealthy male body (Rennolds, 2022). It is precisely this positioning that enabled the construction of superiority over the “other,” and thus the maintenance of inequality.

In educational contexts, retaining the human in this exalted position means that attempts at openness and equity remain reactive, reproducing the same structural exclusions they seek to overcome. In our framing, posthumanism is less about erasing the species’ identity and more about dismantling the ego of the “ideal” specimen—and, by implication, the “ideal” student.

As an ontological stance, posthumanism encompasses several interrelated principles:

- rejecting entrenched dualisms (Bayne & Jandrić, 2017);
- interrogating and disrupting human exceptionalism (Dhungana, 2023; Haythornthwaite et al., 2016);
- foregrounding relationality and entanglement (Barad, 2007; Bayne & Jandrić, 2017);
- seeing agency as distributed across human and more-than-human assemblages (Gourlay, 2021); and
- recognising knowledge as co-constituted between knower and known (Haythornthwaite et al., 2016; Knox, 2015).

Posthumanism also emphasises continual ‘becoming’ through intra-actions (Ferrando, 2023; Postma, 2016), attributes agency to all matter (Gourlay, 2021; Knox, 2015), recognises an ethical responsibility to the broader more-than-human world (Ferrando, 2023; Peppler et al., 2020), and challenges normative standards (Kouppanou, 2022).

From the scoping review, a quote that resonates here reads (Bayne & Jandrić, 2017, p. 14):

Posthumanism is concerned with the questioning of the foundational role of ‘humanity’ as it has been constructed in modernity. Rejecting clear distinctions between ‘nature’ and ‘culture’, it also rejects dualisms and the binaries we have tended to draw on to define what it means to be human in the world: human/machine, human/animal/, subject/object, self/other and so on. (Quotation 6:21)

For Open and Distance e-Learning (ODeL), these principles present opportunities to reimagine pedagogies for digital environments (Bayne & Jandrić, 2017; Dhungana, 2023), broaden the scope of social justice (Kouppanou, 2022; Peppler et al., 2020), and disrupt humanist underpinnings in dominant educational theories as part of decolonial work (Bayne & Jandrić, 2017). This also demands a rethinking of openness itself—a concept with no single agreed definition (Sakkoula & Lionarakis, 2024).

Open Education Philosophies

While open education aspires to increase access, democratise knowledge, and empower learners, it often does so through frameworks that leave humanist assumptions about the learner intact. A posthumanist lens reframes openness by attending to human–more-than- human entanglements and recognising education as an inherently relational, ecological process. Informed by Félix Guattari’s

notion of transversality, education in this view is not confined to vertical hierarchies but emerges through networks of relationships, environments, and material ecologies (Cole & Bradley, 2018).

Transversality offers a language for the interwoven relationships between human and more-than-human actors, positioning learning as an ongoing series of encounters across diverse entities and environments (Dhungana, 2023; Kouppanou, 2022). Redefining openness in these terms means acknowledging the environmental, social, and material contexts that co-shape learning (Cole & Bradley, 2018).

In South Africa, openness is generally framed through the lens of ODL, in contrast to full-time contact provision. In this context, it entails (Akintolu & Letseka, 2024):

- redressing historical exclusion;
- removing barriers and increasing access;
- providing flexibility and student-centredness;
- ensuring affordability;
- embedding transformation and social change;
- fostering inclusivity and collaboration; and
- welcoming diverse learner backgrounds.

However, context shapes the meaning of openness, making it inherently unstable (Akintolu & Letseka, 2024). The digital divide further complicates ODeL provision, suggesting the need for approaches that go beyond access alone (Letseka, 2015). We question whether access—framed in terms of entry and throughput—is sufficient, and whether measures of success tied to employability sustain the very inequities openness aims to address. A posthumanist, embodied perspective invites a more expansive vision that resists this instrumental logic.

Bringing posthumanism into conversation with open education allows Global South ODeL to challenge instrumentalist models of learning and make room for “slow” scholarship and ontological inclusion—supporting diverse ways of knowing, being, and succeeding. In this space, the learner is no longer a unit of productivity but an entangled bodymind whose learning is lived and relational. Points of tension between the two traditions—such as open education’s universal learner versus posthumanism’s situated, relational subject—become productive sites for rethinking openness.

Embodied Learning

Munro (2018, p. 7) defines embodied learning as “the deliberate use and recognition of multimodal bodymind activities and strategies to facilitate shifts in perspectives, perceptions, paradigms, behaviour and actions.” Her nine principles—holistic integration, organic congruencies, personal uniqueness, sensory awareness, inner/outer interweaving, continuous change, habitual patterns, re-patterning, and self-teaching—provide a framework for rethinking equity and openness in posthumanist-informed ODeL.

From a posthumanist standpoint, the traditional disembodied learner disappears; instead, the student is understood as an affective, sensory, relational being embedded in socio-material networks (Bayne, 2004; Knox, 2015; Munro, 2018). Learning is not reducible to cognitive processes in digital space—it is enacted through relationships between learners, environments, technologies, and materialities (Knox, 2015). Introducing embodied learning into open education reframes participation

and agency in ways that disrupt narrow success metrics, inviting pedagogies that attend to the lived entanglements of ODeL learners.

Where posthumanism, open education philosophies, and embodied learning intersect, they offer a framework with generative possibilities for rethinking ODeL pedagogies. While posthumanism disrupts the exclusionary assumptions of humanism, openness as reoriented through a post-humanist lens becomes more inclusive, equitable, relational, and ecologically aware, and when embodied learning is anchored in the lived, material, and sensory realities of learners, it supports ODeL pedagogies that are relational rather than transactional, responsive rather than standardized, are ethically attuned, and inclusive of distributed agency across human and more-than-human actants. As such, it is fundamentally *Ubuntu* to approach open and distance online education from a posthumanist perspective in a technologically integrated, post-pandemic, AI-entangled world of more-than-human intra-action.

This conceptual and theoretical framework underpins and guides the scoping review's mapping of the available literature at this intersection. The gaps, trends, and opportunities identified through this scoping review are integral to advancing equity in ODeL for the Global South. The synthesis of the findings of the scoping review, presented in this paper, yield provocative ideas and recommendations for pedagogical innovation and reform.

METHODS

Research Method and Design

This scoping review is designed to systematically map and synthesise scholarly literature exploring the intersections between posthumanism, embodied learning, and openness in higher education, with a particular focus on Open and Distance e-Learning (ODeL). A scoping review method was selected because it is well suited to conceptually complex and emerging areas of research, allowing for a broad examination of how these intersecting concepts are being engaged and conceptualised, and for the identification of gaps for future research.

This review follows the methodological framework outlined by Arksey and O'Malley (2007), which involves a six-step process:

1. identifying the research questions,
2. identifying relevant studies,
3. selecting eligible studies,
4. charting the data,
5. collating, summarising, and reporting the results, and
6. optional consultation with stakeholders.

To ensure methodological rigour, transparency, and reproducibility, the review is guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) (Tricco et al., 2018) (Appendix A). **No formal protocol was developed for this scoping review.**

The guiding research question is:

What is the current state of scholarly engagement with posthumanism, embodied learning, and openness in ODeL contexts, and how are these concepts intersecting or being conceptualised in the literature?

The review drew on iterative refinement of search terms and inclusion criteria to capture the most relevant studies at this philosophical and pedagogical intersection.

Data Collection Tools

Search string development

Initial search strings were broad and produced large sets of irrelevant results or none at all. Following a consultation with a Research Psychologist colleague, terms were refined to focus exclusively on the three intersecting concepts and increase specificity.

- Original search string – yielded no relevant results in most databases:
("posthumanism" OR "posthumanist education") AND ("open education" OR "ODeL" OR "distance education") AND ("embodied learning" OR "bodymind" OR "multimodal learning") AND ("Ubuntu" OR "eco-justice" OR "social justice")
- Final search string – used for all database queries:
("posthuman" OR "posthumanist philosophy" OR "critical posthumanism") AND ("embodied pedagogy" OR "embodied learning" OR "embodied*") AND ("openness" OR "open education*") AND ("higher education*")

The final search string reflects:

- *Posthuman* terms to capture ontological/philosophical scope.
- *Embodied* terms to capture bodymind and somatic learning principles.
- *Openness* terms to capture the open education dimension.
- *Higher education* to narrow results to relevant tertiary contexts.

Search process

Databases searched: SpringerLink, EBSCOhost, Scopus. ERIC and Web of Science were tested but yielded no relevant results. Records were exported with full metadata; missing abstracts were supplemented from introductions; missing keywords were noted.

- Date of search: 23 July 2025
- Databases searched:
 - SpringerLink – 9 relevant results
 - EBSCOhost – 1 relevant result
 - ERIC – 0 relevant results (across all tested variations)
 - Web of Science – 0 relevant results (across all tested variations)
 - Scopus – 11 relevant results
- Filters applied: peer-reviewed journal articles, English-language only, publication between 2014 and 2025 (July).

All included records were exported into an Excel spreadsheet with full metadata and assessed for inclusion in the final dataset. The dataset was subsequently refined from 21 articles to 10, which were then imported into ATLAS.ti (ATLAS.ti Scientific Software Development GmbH, 2025) for thematic coding.

Sampling or research group

Inclusion criteria

- Peer-reviewed journal articles in English.
- Explicit engagement with posthumanist philosophy, embodied learning, and/or openness in higher education.
- Focus on higher education contexts, including but not limited to ODeL.
- Published between 2014 and 2025 (up to the date of search).

Exclusion criteria

- Book chapters, dissertations, grey literature, and conference proceedings.
- Studies not addressing at least one of the three core concepts.
- Works published before 2014.
- Non-English language publications.

The final sample, after data was screened in an Excel spreadsheet, yielded 10 articles published between 2016 and 2025.

Research Procedures

1. Database selection & searching
 - SpringerLink, EBSCOhost, and Scopus retained as core databases.
 - ERIC and Web of Science tested but excluded due to no relevant results.
2. Screening & eligibility
 - Title/abstract screening to exclude irrelevant works.
 - Full-text screening for inclusion/exclusion criteria.
 - Ambiguous cases marked “Revisit / Unclear” in ATLAS.ti for later decision and resolved before final synthesis.
3. Data management & coding
 - Pre-defined codebook created in ATLAS.ti.
 - Inductive coding added for nuanced expressions of embodiment and conceptual intersections.
4. Data synthesis
 - Code-by-code export of quotations for thematic synthesis.
 - Quotations summarised to reflect the range of perspectives across the literature.

Validity and reliability measures

- Transparency: All search decisions, inclusion/exclusion criteria, and coding choices were documented.
- Iterative coding: Combination of deductive (codebook) and inductive coding approaches.
- Peer review: Thematic coding and early findings reviewed by an external mentor to ensure consistency.

- Audit trail: All changes tracked for replication.

Intercoder reliability measures were not applied in this review. Given the conceptual and exploratory nature of the study, the coding process relied on the authors' subject matter expertise and interpretive depth, rather than on statistical agreement metrics. To ensure rigour and transparency, all coding decisions were documented in an audit trail, with reflexive notes maintained throughout the process. Emerging interpretations were discussed between authors to ensure conceptual alignment and mitigate individual bias. This approach is consistent with interpretivist and post-qualitative traditions, where meaning-making is inherently situated and researcher reflexivity is prioritised over procedural duplication.

FINDINGS AND DISCUSSION

This scoping review sought to map the intersections between posthumanism, embodied learning principles, and openness in the available literature on digital and/or distance education. A further aim was to establish whether any of the scholarly literature that articulated the intersection under review fell within the field of Open and Distance e-Learning (ODeL). The findings of this scoping review revealed that, while there are conceptual innovations, methodological experimentation, and ontological shifts in the available literature, there are significant gaps and tensions relevant to the South African and Global South ODeL context. The following sub-sections discuss the findings under each coding theme.

Theme: Conceptual Intersections

Across the literature included for thematic coding, there is a strong posthumanist ontology that critiques the anthropocentric and humanist views of the learner, openness, and online learning (particularly in reference to the COVID- 19 pandemic and digital shifts that ensued). Much of the literature critiques the dominance of the rational and autonomous learner, emphasizing the need for the student to be reimagined as a subject that is ethically, socially, and materially entangled. Some studies posit that entanglement and more-than-human relationality are central to education in a time where human and more-than-human agencies co-constitute learning.

The fragmented cyborg does not strive for completeness or unity; rather, it ironizes over its roots in humanist ideas, capitalist politics, and digital systems. It is wary of taken-for-granted dualisms... It suggests dissolving boundaries between humans and machines as digitally connected humans become embedded with communication devices. (Quotation 4:13, p.3) (Hilli & Jusslin, 2023, p. 45)

This entanglement of human and non-human actors has never been so acutely felt as in the advent of large language models (LLMs), such as ChatGPT. Here we become partners in what Haraway (1988) terms 'worlding'—referring to the notion that the knower and the known cannot be separated. We, as human partners, can never step out of these knowledge-making practices, but are part of it, complicit, entangled, and emergent as 'the knowing subjects ...immanent to the very conditions they are trying to understand, change or resist' (Braidotti 2019: 154). (Quotation 5:12) (Gachago et al., 2024, p. 178)

Contrary to our anticipations, embodied learning was a particularly rich site of overlap in the literature. While the treatment of embodiment did not consider the principles of embodied learning, the

literature takes a clear stance in challenging the prevailing Cartesian separation of body and mind in currently applied pedagogies. The call to acknowledge socio-material situatedness, affective, and sensory bodymind of the learner suggests that what we consider to be 'open education' should be reconceptualized beyond access and affordability. For distance and digital education to be fully inclusive, equitable, and open in the posthumanist sense is to recognize the embodied differences of entangled learners and the distributed agency of relational learning.

As immanent (always in-becoming), relationality can be the alternative to individualist autonomy, so that shared understandings of our posthuman futures are embodied, embedded, and affirmative entanglements of solidarity, care and compassion. Alternative pathways for decolonising the curriculum open-up when the world is deeply intertwined in ethics, knowing and being (ethico-onto-epistem-ology), in ways that appreciate that our aspirations to challenge dominant education paradigms must come from a position where we recognize that "we are of the world", and only when we are inside and of the world through our relationality, can we begin to imagine a embodied and embedded decoloniality. (Quotation 3:54, p.9) (Simmonds, 2025, p. 41).

Despite the rich intersections, tensions persist. The continued emphasis on scalability in open education practices risks standardisation—as opposed to posthumanist perspectives' valuing multiplicity, difference, and 'becoming-minoritarian'. This tension is particularly salient in discussions of MOOCs, which some argue reproduce exclusionary practices and colonialist structures despite promises of openness and equity. This tension is most aptly captured in Knox's 2016 article titled 'Posthumanism and the MOOC: opening the subject of digital education:

Adhering to a humanist framework, what MOOCs appear to promote is an 'other' time and an 'other' space; a virtual dimension to education that conveniently escapes the complex and unequal material landscapes of Internet access, the working realities of educational institutions, and the increasing pressures to streamline and maximise our limited time in a condition of finitude. (Quotation 10:20) (Knox, 2016, p. 309).

Theme: Methodology and Methods

The reviewed literature, while methodologically diverse, has a strong leaning toward qualitative and post-qualitative approaches. Particularly prominent are ethnography and autoethnography, which integrates personal reflection and situated positionalities to explore posthumanist praxis. These approaches illustrate the experience of entanglement for researchers in their material contexts, resisting detached or objectivist framings.

Four curriculum studies scholar activists shared their narratives of how they are enacting their curriculum to challenge dominant education paradigms. Their lived experiences as material, relational, embodied and embedded incite posthuman tendencies of what it means to teach to transgress. (Quotation 3:9) (Simmonds, 2025, p. 33)

The anecdote may not seem 'at first glance to belong to an academic repertoire of methods at all' (Lury and Wakeford 2012: 3), yet when understood as a process and a verb, anecdotalisation can become a powerful method of qualitative inquiry into intersecting, shared experiences. The operationalisation of the anecdote helps authors to identify questions and tensions manifest in complex phenomena, that are impervious to a single

analytic vantage point or even a single research-positionality. (Quotation 9:41-9:42) (Lacković et al., 2024, p. 806)

Post-qualitative methodologies are also evident, with scholars explicitly “thinking with theory” (Hilli & Jusslin, 2023, p. 50) to experiment with new forms of inquiry. Simmonds (2025) draws on decolonial and feminist posthumanism to interrogate curriculum, and pedagogy, while for Hilli and Jusslin (2023, p. 46) “[d]idaktik and hybridity are rooted in anthropocentric notions of education upholding distinctions between humans and others” and the posthuman cyborg was used to interrogate “the technological and political tensions within higher education”. Notably, few mixed-methods designs and a lack of quantitative, empirical research at the intersection of posthumanism, embodiment, and openness were present, which suggests that the intersection of fields remains dominated by interpretative, critical, and phenomenological traditions.

This methodological leaning aligns with the conceptual thrust of posthumanism, which problematises universalising claims and privileges situated, relational knowledge production. However, it also indicates a gap in terms of empirical diversity—particularly studies that could test posthumanist-informed pedagogical interventions in the context of ODeL in the Global South.

Theme: Ontological and Epistemological Framing

This scoping review illustrates that there has already been a clear turn toward posthumanist ontology in the academic search for more equitable education in the current technological milieu. The reviewed literature frequently criticizes humanism, dualisms, binaries, and the prevailing privileging of rational subjectivity. Scholars emphasize distributed agency, ethics of entanglement, and more-than-human relations as foundational tenets to a posthumanist ontological stance, often following the work of Barad (2007) on agential realism, and the work of seminal posthumanist scholars, such as Rosi Braidotti, Francesca Ferrando, and Donna Haraway. To recognize technology, matter, and the environment as agential in the context of learning (particularly ODeL higher education post-COVID-19) challenges the prevailing instrumentalist view of technology as tools.

Invoked by new materialism, intra-actions of our becoming within and as part of the world are the deep entanglements of ethics, knowing and being that can spur scholarly activism. (Quotation 3:62) (Simmonds, 2025, p. 33)

Posthuman subjectivity is thoroughly decentered, and rejects the progress of mankind through a self-regulatory and teleological ordained use of reason... aimed at the perfectability of ‘Man’. (Quotation 10:44) (Knox, 2016, p. 317)

While the treatment of posthumanism across the reviewed literature aligns closely with our own working definition, its scope and application are notably broad. In many cases, posthumanism was mobilised for highly specific educational phenomena—including digital writing practices, MOOCs, and curriculum design—without always situating these insights within a larger philosophical framework. This indicates that, although the posthuman is already a productive entry point for rethinking education, there is a lack of macro-level theorisation that can hold together these dispersed engagements. For Open and Distance e- Learning (ODeL), particularly in the Global South, we propose that a posthumanist onto-epistemological framework needs to be concisely articulated—one that explicitly links questions of access, equity, and eco-justice to the historical and ongoing more-than-human injustices that entangle our education systems within colonialist structures.

Theme: Study Characteristics

The body of literature reviewed spans predominantly qualitative and participatory/action-oriented research, with strong theoretical groundwork. However, there is a distinct absence of purely quantitative work, and few design-based or case-specific pedagogical studies.

Participatory and action research emerged as richest area in this theme, particularly in work on decolonial practices and feminist posthumanist approaches, emphasising collaborative work and activism. The prevalence of mixed-methods studies reflects the methodological hybridity and transdisciplinarity consistent with posthumanism epistemologies, which are sceptical of overly reductive approaches, but welcome diverse data integration.

The theoretical or conceptual works included feminist posthumanism, new materialism, and critical posthumanism as lenses through which to rethink education. However, only a single study in the review spoke specifically to the South African context, indicating a significant gap in Posthumanist ODeL scholarship for the Global South. From our view, this gap holds significant promise for macro-level theorisations to benefit local practices of openness, Ubuntu, and embodied learning.

Theme: Findings and Contributions

Conceptually, posthumanism enables new critiques of openness, moving discourse beyond access toward relationality, embodiment, and entanglement. Pedagogically, posthumanism open alternative designs including hybrid didaktik (Hilli & Jusslin, 2023), multimodal literacies (Lacković & Popova, 2021), and equity-oriented design (Gachago et al., 2024), which resist reductive models that treat the learner as an exclusively cognitive unit.

An anti-Eurocentric and decolonial emphasis is clear throughout much of the reviewed literature. Scholars critique privileging knowledge embedded in the Enlightenment project (Olteanu & Campbell, 2023; Taylor, 2017) and call for a more diverse representation of epistemologies in curricula (Simmonds, 2025). Simmonds (2025) warns that the decolonial rhetoric risks remaining abstract and, as such, unimpactful, unless we seek ways to enact decolonialised higher education in material and embodied ways.

Eco-justice and sustainability also appear as emerging concerns, with posthumanist ethics invoked to foreground more-than-human relationality and ecological responsibility. Such framings suggest that ODeL cannot be re-imagined solely in human terms, but must attend to planetary interdependence. These sentiments are illustrated in the following selection of quotations:

This concept of Nature justified the modern Western enthusiasm for putting the power of the human mind to use for the production of technologies “for the purpose of conquering nature” (Cobley 2014 [2001]: 137). Sadly, apparently only something as grave as the global environmental crisis could shake humanity out of the daydreaming of Romanticism and the reductive idealism of the Enlightenment project. (Quotation 2:42) (Olteanu & Campbell, 2023, p. 177)

A “zoe-centred egalitarianism” is the core of a posthuman feminism educational practice because it can “inspire us to resist the trans-species commodification of Life by advanced capitalism”. (Quotation 3:14) (Simmonds, 2025, p. 37)

While Barnett's ecological university is formulated in anthropocentric terms as 'a metaphor for the fullest expression of possibilities for this earth and for the place of humanity on it' (Barnett 2011, p. 142), I want to suggest an idea of the university as an entangled posthuman partnership in world-making. Such an ethical posthuman formulation replaces notions of care for the 'world' as a separate other available to 'us' (humans) for 'our' benefit with an embodied practice of accountability which registers a continual awareness of our relational becoming-with human and nonhuman others with whom we share this world. (Quotation 7:42) (Taylor, 2017, p. 432)

A posthuman Bildung is a lifelong task of realising one's responsibility within an ecology of world relations, it occurs outside as well as inside formal education, in virtual as well as 'real' places. (Quotation 7:43) ((Taylor, 2017, p. 432)

We are at a point where life on Earth depends on critically considering how the exploitation of physical materiality/substances in the biosphere contributes to new extractivist and neocolonial practices. (Quotation 9:28) (Lacković et al., 2024, p. 803)

Synthesis

Overall, this scoping review suggests that research at the intersection of posthumanism, openness, and embodied learning is present and innovative, yet unevenly distributed across contexts and methodologies. There is a clear and growing recognition of entanglement, relationality, and embodiment in rethinking openness in education, however, most of the work remains highly context- or phenomenon-specific. In our view, this reflects the need for a clearly articulated onto-epistemology that can hold more specific and practical research into increasing equity and justice in ODeL pedagogies. For the South African ODeL context, the implications we propose are: if openness is to fulfil its promise of inclusivity and justice, it must, alongside the focus on access and affordability, move toward pedagogical practices that acknowledge learners as entangled, embodied beings within socio-material and ecological systems.

CONCLUSION, IMPLICATIONS AND SUGGESTIONS

Advantages

This scoping review offers one of the first attempts to map literature at the intersection of posthumanism, embodied learning, and openness in ODeL. The ATLAS.ti-coded framework also presents the findings in a transparent analytical structure, which may be replicated or adapted by researchers working at similar conceptual intersections. The scoping review draws together diverse perspectives from posthumanist ontological positioned scholars and attempts to identify ways in which these perspectives influence approaches to pedagogy. Furthermore, the review highlights underexplored framings of embodiment, specifically in the context of distance and digital learning, that could redefine 'openness' in ways that resist tracing participation metrics of the 'autonomous and rational subject' learner. Finally, this review offers a comparative lens for exploring the alignment between posthumanism and decolonial aims in higher education contexts.

Limitations

This scoping review is limited by the choice to limit the scope of sources and the scope of language—due to time constraints and a narrow scope for this preliminary survey of available literature, we

excluded book chapters to focus solely on peer-reviewed journal publications in a language that both authors are currently proficient in. By doing so, some influential work in other linguistic and cultural contexts may have been omitted. However, these choices were deliberately made to maintain the scope and comparability.

As the intersection between posthumanism, embodied learning, and openness in education is an emergent field, there is much development yet to come, meaning the available literature is relatively sparse. Many of the articles coded for this review engaged with only two of the three concepts or alluded to concepts under review, as opposed to explicitly engaging with them. Another significant limitation is of possible conceptual coding bias, since both inductive and deductive codes were determined by the authors' theoretical framework and expertise on the three concepts, which could lead to ambiguous cases or limit alternative readings of the intersection under review. This scoping review could be interrogated for additional insights in future research.

Suggestions for Future Research

This scoping review holds several promising avenues for further research at the intersection of posthumanism, embodied learning, and open education, particularly for the ODeL context. Perhaps most salient of these avenues is the need for empirical studies that design ODeL environments and redefine ODeL pedagogy using the three concepts in combination, rather than in isolation. Context-specificity is also of upmost importance for the Global South, where research should explore how the intersection under review impact the socio-material realities of learners in countries inundated with digital divides and infrastructural inequalities.

Future research could also explicitly examine the synergies and divergences between posthumanism and decolonial theory, philosophically and pedagogically. A broader application of embodiment, as understood in arts disciplines and posthumanism, could hold significant implications for ODeL design and technological innovations. The bodymind understanding of the learner across disciplines could assist in broadening the notion and measurement of 'success', as metrics of throughput and employability are replaced by alternatives that are ethical, relational, and ecologically sound.

Finally, we anticipated that the literature would yield more salient nodes of convergence that speak either directly or indirectly to Ubuntu philosophy. As such, there is much conceptual work to be pursued on the combined tenets of Ubuntu and posthumanist onto-epistemological stance, toward a posthumanist-aligned Ubuntu ethics for ODeL research.

Possible Impact and Applications

The insights from this scoping review could:

- Redefine openness as relational, ecological, and embodied, which would shift institutional strategies for ODeL
- Inform policy and curriculum by embedding posthumanist and decolonial perspectives into institutional guidelines and quality frameworks
- Enhance learning by practically valuing diverse forms of engagement and participation that are not standardised as digital presence
- Provide tools for educators and instructional designers to integrate embodied learning principles and an ethics of entanglement into their practices

- Promote ethical and sustainable ODeL practices that align with *Ubuntu* philosophy and posthumanist tenets in ways that prioritise social- and eco-justice

The findings suggest that there is an urgency and opportunity to rethink openness through the lenses of posthumanism and embodiment. This scoping review demonstrates that without macro-level, conceptual expansion, the meso- and micro-level research, particularly quantitative inquiries, risk reinforcing the very exclusions that ODeL institutions seek to eliminate.

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APPENDIX A

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	1-9
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	3-6
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	6-7
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	7
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	8
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	8
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	7-9
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	7-9
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	7-9
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	N/A

Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	N/A
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	7-9
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	8-9
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	N/A
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	N/A
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	N/A
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	9-16
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	9-15
Limitations	20	Discuss the limitations of the scoping review process.	15
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	15-16
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	N/A

Table notes:

JB1 = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is

more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA ScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: [10.7326/M18-0850](https://doi.org/10.7326/M18-0850).

Tauira Māori Achievement in a Kaupapa Māori Ako (Educational) Setting: Barriers and Opportunities

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ABSTRACT

This research examines persistent achievement disparities between Māori and non-Māori tauira at Te Wānanga o Aotearoa (TWOA), despite it being a kaupapa Māori tertiary institution. Using a mixed method approach, which included internal enrolment data analysis and Statistics New Zealand's Integrated Data Infrastructure, this study explores tensions between government-defined success metrics and Māori-centred definitions of educational achievement.

Findings reveal TWOA serves a distinctly different student population: 49% identify as Māori, 67% are women, and 44% are over 40 years old. These tauira often face complex circumstances including higher rates of chronic health conditions, caregiving responsibilities, and justice system experiences. Despite challenges, our research demonstrates positive transformation outcomes for students who study at TWOA. For example, tauira Māori experience greater relative income growth post-enrolment and higher whānau educational engagement rates compared to non-Māori. However, the Tertiary Education Commission performance indicators focus primarily on completion rates and fail to capture holistic benefits including cultural revitalisation, identity strengthening, and whānau transformation that constitute success from Māori worldviews.

The study argues current funding mechanisms based on Western metrics of individual achievement are inappropriate for Indigenous tertiary institutions and may impede success by creating compliance burdens that divert resources from culturally responsive support. The research calls for recognition that addressing underlying societal inequities is essential for sustainable improvement in tauira Māori outcomes, advocating for success measures that honour both academic achievement and cultural aspirations within te ao Māori frameworks

Keywords

Kaupapa Māori, Wānanga, Student success, Transformation, Ako, Educational outcomes, Funding, Metrics, Achievement, Tertiary education

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INTRODUCTION

Persistent educational disparities between Māori and non-Māori students in Aotearoa New Zealand remain one of the tertiary education sector's most enduring challenges. Despite decades of policy initiatives, significant achievement gaps persist across all measures of educational success (Ministry of Education, 2023).

Te Wānanga o Aotearoa (TWOA), established in 1984 as a kaupapa Māori tertiary institution, was founded to provide "holistic education opportunities of the highest quality for Māori, peoples of Aotearoa and the world." As the largest wānanga and the tertiary institution with the highest proportion of Māori students, TWOA represents an Indigenous response to mainstream education's failure to serve Māori learners adequately.

However, the 2022 External Evaluation and Review (EER) report identified a critical paradox: despite TWOA's kaupapa Māori foundation and culturally responsive framework, achievement gaps persist between tauira Māori and non-Māori students using traditional academic measures (NZQA, 2022). The report's recommendation to "progress, as a priority, lifting the achievement of tauira Māori" reflects the ongoing dominance of Western-oriented success metrics potentially misaligned with Māori educational aspirations.

This research addresses the tension between institutional mission and measured outcomes, investigating how success should be conceptualised within kaupapa Māori educational settings. By examining both quantitative student outcomes and qualitative dimensions of success for Māori learners, this study provides a nuanced understanding that honours academic accomplishment and cultural aspirations.

The significance extends beyond TWOA, offering lessons for global Indigenous education movements and settler colonial nations addressing educational inequities. The research is particularly timely given the 2020 Education and Training Act's Wānanga Enabling Framework, which recognises greater wānanga autonomy whilst maintaining Crown oversight.

This mixed-methods research combines quantitative analysis of institutional data and Statistics New Zealand's Integrated Data Infrastructure with qualitative exploration of how tauira Māori understand success, though this paper focuses on quantitative data and literature exploring tertiary success metrics.

The study seeks to contribute to a more sophisticated understanding of tauira Māori success in tertiary education and how institutions can better support multidimensional definitions of achievement. By

examining TWoA's context—where Māori pedagogies are central and Māori students constitute the majority—this research offers insights for Indigenous educational institutions navigating tensions between Indigenous aspirations and government accountability frameworks.

The findings have direct implications for educational policy, institutional practice, and funding mechanisms within Aotearoa's tertiary education sector, whilst contributing to international discussions about developing culturally responsive measures of educational success that honour Indigenous knowledge systems.

LITERATURE REVIEW: MEASURES OF TAUIRA MĀORI SUCCESS: GOVERNMENT METRICS VERSUS MĀORI ASPIRATIONS

The conceptualisation of success for tauira Māori in tertiary education reflects fundamental tensions between Western institutional frameworks and Indigenous worldviews. While government measures emphasise quantifiable outcomes such as completion rates and qualification achievement (Ministry of Education, 2013; Hook, 2006), Māori-centred definitions embrace holistic frameworks recognising the interconnectedness of academic achievement with cultural identity and collective wellbeing.

Traditional tertiary success metrics in New Zealand have predominantly reflected Western educational values, focusing on measurable outcomes aligned with neoliberal accountability frameworks. Hook (2006) notes these conventional measures often fail to account for Indigenous worldviews and perpetuate colonial power structures. Earle's (2007) analysis identified institutional definitions centred on course completion, qualification achievement, and progression to higher study—metrics providing quantifiable data but criticised for failing to recognise cultural dimensions.

Bishop (2008) argues these Western-oriented measures can reinforce deficit theorising about Māori outcomes, positioning Māori students as problems rather than recognising systemic barriers. The emphasis on individual achievement conflicts with collectivist Māori values prioritising community benefit and relationship-building (Mayeda et al., 2014).

Government policy has evolved to acknowledge Māori perspectives, though implementation remains problematic. The Tertiary Education Strategy 2020-2025 explicitly recognises success must reflect Māori aspirations and values (Ministry of Education, 2020), whilst Ka Hikitia promotes "Māori achieving education success as Māori" (Papuni-Ball, 2020).

However, significant tensions persist between policy statements and practice. Kidman et al. (2015) argue that despite policy rhetoric acknowledging holistic success definitions, funding and accountability mechanisms continue privileging conventional metrics. McAllister et al. (2019) document ongoing disconnects between rhetoric acknowledging Māori conceptions of success and institutional practices emphasising traditional metrics.

Māori-centred definitions embrace holistic frameworks grounded in cultural values and collective aspirations. Durie's (2001) influential framework identified three goals: to live as Māori, actively participate as world citizens, and enjoy good health and high living standards. This multidimensional approach reshaped understandings beyond narrow academic metrics to encompass cultural, social, and spiritual wellbeing.

Penetito (2010) emphasises success must include strengthening cultural identity and maintaining whānau, hapū and iwi connections alongside academic achievement. Pihama et al. (2014) highlight

understanding success through cultural concepts such as mana, tino rangatiratanga, and whanaungatanga, positioning success within frameworks of cultural responsibility and community advancement.

Research centring tauira Māori perspectives reveals complex understandings bridging institutional and cultural domains whilst prioritising cultural authenticity. Greenwood and Te Aika (2008) found tauira Māori defined success as achieving academic goals whilst maintaining cultural identity and contributing to communities.

Theodore et al. (2018) found participants described success as encompassing academic achievement, cultural connection, and community contribution. Adds et al. (2011) documented the importance of "walking in two worlds"—achieving within Western contexts whilst maintaining cultural connections. Kia Eke Panuku (2015) found students defined success as achieving qualifications whilst affirming Māori identity and enabling community contribution.

Tertiary institutions' responses have been varied and often superficial. Wānanga have led in implementing culturally aligned success concepts, with Tassell et al. (2010) noting they typically define success holistically, encompassing academic achievement, cultural revitalisation, and community development.

Mainstream institutions struggle beyond what Webber et al. (2018) term "performative inclusion." Mercier (2014) argues that whilst acknowledging Māori conceptions, structural barriers remain prioritising Western definitions. Funding mechanisms and quality assurance continue emphasising traditional metrics.

For TWoA, these tensions manifest concretely. The 2022 EER report's sole recommendation to "lift tauira Māori achievement" noted persistent gaps in course completions despite positive overall results. However, TWoA tracks broader indicators including mātauranga Māori understanding, cultural identity skills, te reo Māori use, health and wellbeing, and community knowledge sharing.

This dual tracking reflects challenges facing all providers serving Māori students: satisfying government accountability whilst genuinely serving Māori aspirations. The ongoing challenge lies in balancing Māori success definitions with accountability frameworks privileging Western values. This requires structural changes genuinely prioritising holistic wellbeing, cultural affirmation, and collective advancement alongside traditional metrics. Sustainable progress requires fundamental shifts in how educational success is conceptualised, measured, and valued at policy, institutional, and practice levels.

METHODS

The wider project took a mixed method approach drawing on a range of qualitative approaches alongside primary quantitative data collection and secondary data analysis, in this case, an analysis of the Integrated Data Infrastructure (IDI)². This paper focuses in on some of the quantitative analyses

² The Integrated Data Infrastructure (IDI) is a Statistics NZ database combining anonymised microdata from health, education, income, and housing sources. Records are linked to unique identifiers, enabling analysis across multiple data sources for the same individual. Access is restricted to approved researchers with confidentiality training conducting research for public benefit in Aotearoa.

and the wider literature to explore the appropriateness of measures of success in the Aotearoa Tertiary Education system.

The quantitative analysis in this report draws on data from two sources: internal enrolment data held by TWoA and linked microdata data from the Stats NZ Integrated Data Infrastructure (IDI). This section outlines the methods and data sources used to analyse both the IDI data and internal enrolment data. Using the IDI we explored several different characteristics of tauira. Of particular interest are factors related to tauira before and after their time at TWoA and how this might compare with tauira at other tertiary education providers. This can give us information about the backgrounds and experience that tauira bring to their time at TWoA and about transformation for them and their whānau that might follow their enrolment.

Datasets Used

The IDI datasets and data sources used for the analysis in this report cover Demographic characteristic data for TWoA tauira; Whānau connection data on student's family status, Hauora data, Language acquisition data; Further education data that identified students who have continued with education at TWoA, students with further education at other tertiary institutes, or further education at industry training programmes; Income data; Experiences with institutional systems data.

Internal Enrolment Data Analysis

By using enrolment data from TWoA we complemented the IDI analysis with more detailed information about patterns of enrolment at TWoA. While this data lacks the richness of IDI data that comes from different sources, it presents an opportunity to validate some of the IDI data and, in some cases, to add additional detail about factors relevant to enrolment that are not visible from IDI data. The internal enrolment data spans the period 2014–2024 and covers a range of variables related to tauira, the courses they enrol in, and course completion outcomes.

FINDINGS AND DISCUSSION

As noted previously, the success data (with success being measured according to the Tertiary Education Commission's criteria for success as articulated by the Educational Performance Indicators (EPis)) highlights that tauira Māori are not achieving at the same rate as tauira who are not Māori, even whilst studying at a kaupapa Māori tertiary organisation. To explore reasons for this, we first sought to understand who our tauira were and in several cases compare that to other tertiary education providers.

The IDI data used in this report are not official statistics. They have been created for research purposes from the Integrated Data Infrastructure (IDI) which is carefully managed by Stats NZ. For more information about the IDI please visit <https://www.stats.govt.nz/integrated-data>.

Access to the data used in this study was provided by Stats NZ under conditions designed to give effect to the security and confidentiality provisions of the Data and Statistics Act 2022. The results presented in this study are the work of the author, not Stats NZ or individual data suppliers

Understanding Our Taiura

Age, Sex, and Ethnicity of the TWoA Student Population³

The student body at TWoA is ethnically diverse. Of the tauira enrolled between 2014 and 2023 (internal data), 49% were Māori, 27% European, 12% Asian, 8% Pacific, and 4% another ethnicity, see Figure 1.

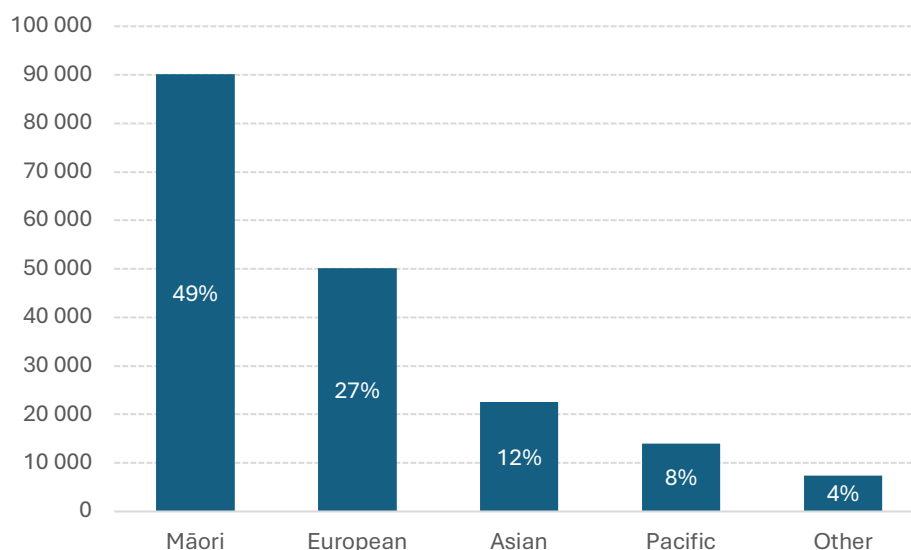


Figure 1. Number of Unique Taiura Enrolled in TWoA by Prioritised Ethnicity (2014-2023)

Source: Internal TWoA data.

There is a strong representation of tauira Māori at TWoA even beyond the timeframe in Figure 1 with 45% of tauira ever enrolled (i.e. from 1992 onwards, as measured in the IDI) identifying as Māori. Indeed, of the tauira who identified as Māori, 27% identified solely as Māori (i.e. they did not identify with another ethnic identity as well). This representation is significantly higher than the tauira Māori representation at Polytechnic institutions; 18% of tauira for whom data exists in the IDI (1992 onwards) identified as Māori or Māori plus another ethnicity.

There is also a strong representation of women students (67%) compared to men students (IDI data 1992 onwards) when looking at all enrolments at TWoA. Again, this is different at polytechnics where there is more equal representation of women and men students, roughly comparable to the total the population in Aotearoa.

Tauira at TWoA tend to be older than those at other tertiary education providers with 44% of tauira at TWoA being over 40 years old, compared with only 31% at polytechnics (Figure 2; IDI data, 1992 onwards).

³ Within this report we use demographic data for tauira from two different sources: internal enrolment data from TWoA and data from the Stats NZ Integrated data Infrastructure (IDI). Data such as ethnicity may be recorded differently for tauira between these two data sources and different data recording may mean that even when trying to compare a subset of tauira over the same period the exact population may differ slightly. This can lead to differences in summary statistics, particularly for self-declared attributes like ethnicity. To mitigate against confusion from any potential discrepancies, we have endeavoured to indicate the data source and period of study alongside demographic information that could have come from multiple sources.

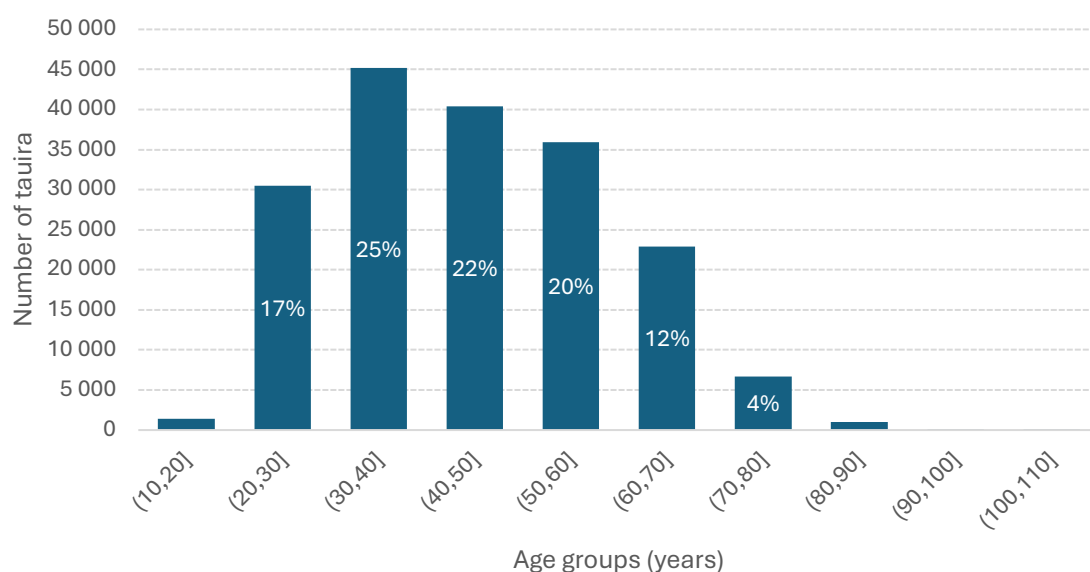


Figure 2. Number and Proportion of Unique Tauira Enrolled in TWoA by Age Group
Source: Internal TWoA data.

Experiences of Crime and Possible Interactions with the Justice System

Based on IDI data, approximately 20% of tauira at TWoA are reported as having been an offender of a crime⁴ in their lifetimes, a slightly higher rate than the approximately 15% at polytechnics (Figure 3). These statistics do not indicate whether the individual in question was an offender *while* studying at TWoA.

Across all ethnicities, except Asian, the likelihood of being reported as an offender of a crime is higher at TWoA than at polytechnics. The difference in rates, between TWoA and polytechnics, is minimal for Māori but is more pronounced among Pacific and European students. The difference is also observable among men and women: men are around twice as likely to be reported as offenders, compared with women (30% for men compared with 15% for women at TWoA; or 20% for men compared with 10% for women at polytechnics).

⁴ This category counts all alleged offenders recorded by NZ Police. It includes both court and no-court proceedings by Police against alleged offenders. “Offenders” refers to a person Police apprehended because Police allege the person is involved in a criminal incident involving one or more offences. Given that many crimes go unreported by victims (meaning in turn that it is less likely offenders will be apprehended), it is likely that these percentages are an underestimate of the true statistics.

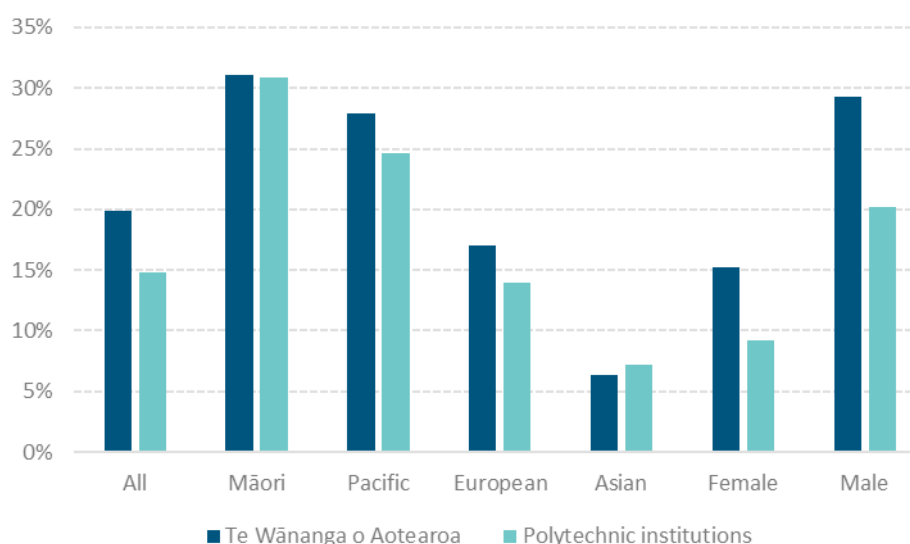


Figure 3. Proportion of Tauira (Ever Enrolled) Reported as an Offender Comparing TWoA and Polytechnic Institutions
Source: IDI data.

While this data does not tell us anything about the likelihood of crime occurring on campus, it does provide an indication of the life experiences of tauira at TWoA relative to polytechnics. Both men and women across most ethnic backgrounds studying at TWoA are more likely to have had offending experience (and possibly interactions with the justice system as a result). Such tauira may require additional (or simply different) support from their institution as a result. Given TWoA delivers educational programmes in prisons to tauira who may be currently part of the criminal justice system - e.g. remote learning for tauira currently serving a sentence – this likely explains some of the patterns seen in this data.

Victimisation was also higher at TWoA than at polytechnics. Almost a quarter of tauira at TWoA reported having been a victim⁵ of a crime, in contrast with only around 16% at polytechnics (Figure 4). Again, this difference holds for tauira of all ethnicities except for Asian, who are slightly less likely to have reported being a victim of crime if they are at TWoA compared to at polytechnics. Once again, these statistics do not necessarily mean that the tauira have reported being a victim of crime while they were studying; it simply indicates that they have been a victim of crime at some stage.

When coupled with the offending statistics in Figure 3 above – that tauira at TWoA are more likely to have faced crime-related challenges in their past when compared with students at polytechnics. As a result, the types of support that the respective institutions provide may need to differ to ensure that tauira are best equipped for success.

⁵ This category represents victims of crime as recorded by NZ Police. Victims are those persons that are directly targeted in the offence. Given that many crimes go unreported by victims, it is likely that these percentages are an underestimate of the true statistics

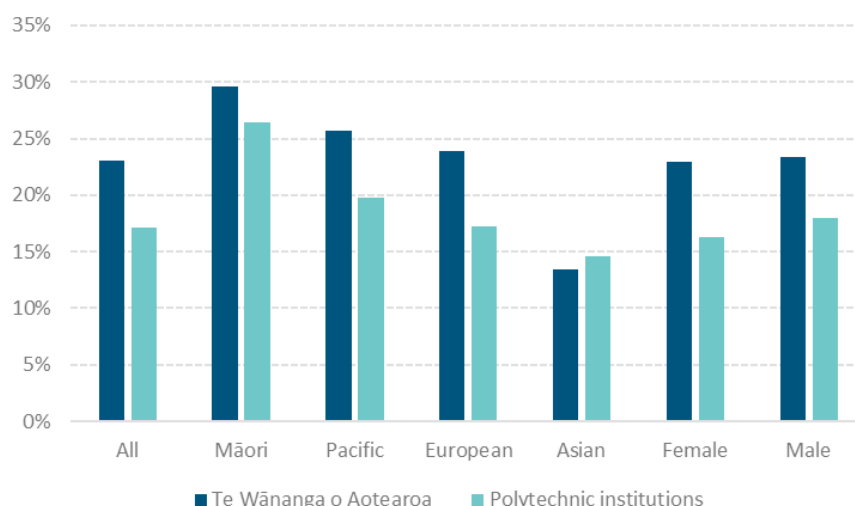


Figure 4. Proportion of Tauira (Ever Enrolled) Reported as Having Been a Victim of a Crime Comparing TWoA and Polytechnic InstitutionsSource: IDI data.

Experiences of Ill Health and Interactions with the Health System

As was earlier stated, the tauira population at TWoA tend to be older and to include more tauira Māori than the student population at other tertiary education providers such as polytechnics. Given that both age and ethnicity are correlated with the prevalence of some health conditions, it is not surprising to see that tauira at TWoA have higher rates of some health conditions than students at other tertiary organisations.

10% of tauira who have enrolled at TWoA have a diabetes diagnosis (Figure 5). This is approximately double the rate of 5% for tauira enrolled at polytechnics. Chronic and complex health conditions such as diabetes can present a particular challenge to tauira who may need additional support or educational allowances. Furthermore, such conditions are often also associated with increased risk or prevalence of other health conditions. As such, not only are tauira at TWoA more likely to have a chronic health condition, but they are also more likely to gain new health issues as a result. This presents an obvious additional challenge during study. Facilitating easy access to health services can help to support tauira with additional or complex health needs.

Prevalence of other chronic health conditions (acute myocardial infarction (AMI), cancer, gout, stroke, and traumatic brain injury (TBI) are also prevalent at higher rates for tauira at TWoA than at polytechnics, though the differences for most are smaller than that observed for diabetes.

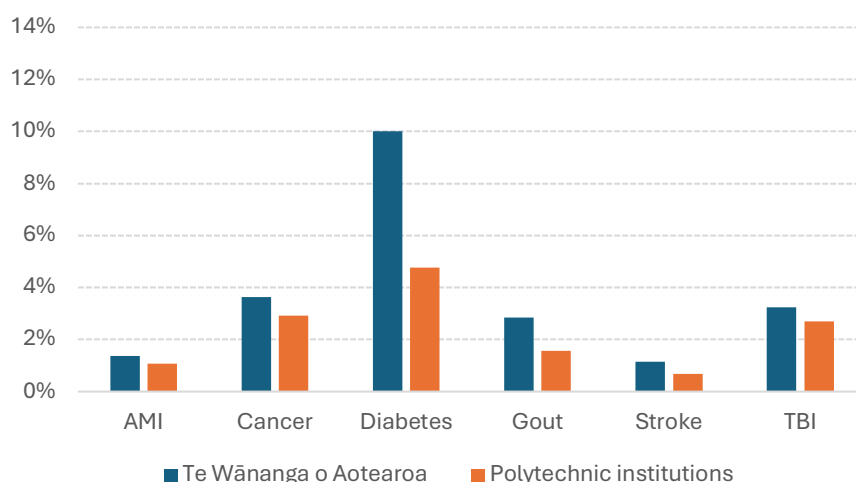


Figure 5. Proportion of Tauira (Ever Enrolled) with a Chronic Condition Diagnosis Comparing TWoA and Polytechnic Institutions Source: IDI data.

Tauira Māori at TWoA have higher rates of diabetes (12%), gout (4%) and traumatic brain injury (5%) compared with all TWoA tauira (10%, 5%, and under 4% respectively). While ethnicity may partly explain higher prevalence rates versus polytechnics, the age difference between TWoA tauira (early-forties) and polytechnic students (mid-twenties) likely contributes to these differences.

This data highlights potential benefits of targeted health support, particularly for tauira Māori, in reducing barriers. It also suggests funding models effective at other tertiary organisations may be insufficient for TWoA where students face increased health burdens.

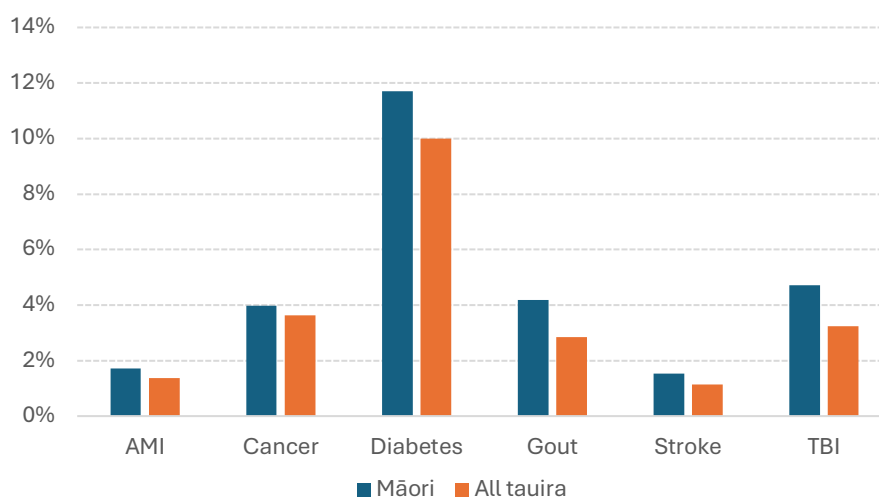


Figure 6. Proportion of TWoA Tauira (Ever Enrolled) with a Chronic Condition Diagnosis Comparing Māori and All Tauira Source: Stats NZ IDI

Household and family role

A further consequence of the student cohort at TWoA being older and predominantly female is that they may be more likely to have caregiver responsibilities compared with tauira at other tertiary

organisations. Figure 7 uses IDI data from Census 2018 to show the family role reported by tauira at TWoA, polytechnics and at universities, split by Māori and non-Māori.

The majority of tauira at TWoA are parents in a family with a partner/spouse (almost 35% for Māori, over 40% for non-Māori) or are a sole parent (17% for Māori, almost 10% for non-Māori). This suggests that tauira at TWoA are likely to have caregiving responsibilities for children or grandchildren.

The pattern is different for other tertiary institutions in Aotearoa New Zealand. The majority of tauira that attend university identify as a “child living in a family” (40% for Māori, 45% for non-Māori) or as “living with another person that is not part of the family” - e.g. living in a student flat (25% Māori; slightly over 25% non-Māori). For polytechnics the pattern is closer to that for universities, though more tauira at polytechnics are likely to be a parent in a family than for tauira at university.

Unlike other tertiary institutions where students typically have no caregiving responsibilities or family support, TWoA tauira are more likely to care for family members whilst studying. However, Census data only captures nuclear family responsibilities and may underestimate broader whānau caring obligations, including for elderly relatives.

There can be different challenges for tauira who are raising a family (e.g. balancing family demands and expectations alongside studying) and so support may look different for them compared to tauira without parental responsibilities (O’Shea et al., 2024).

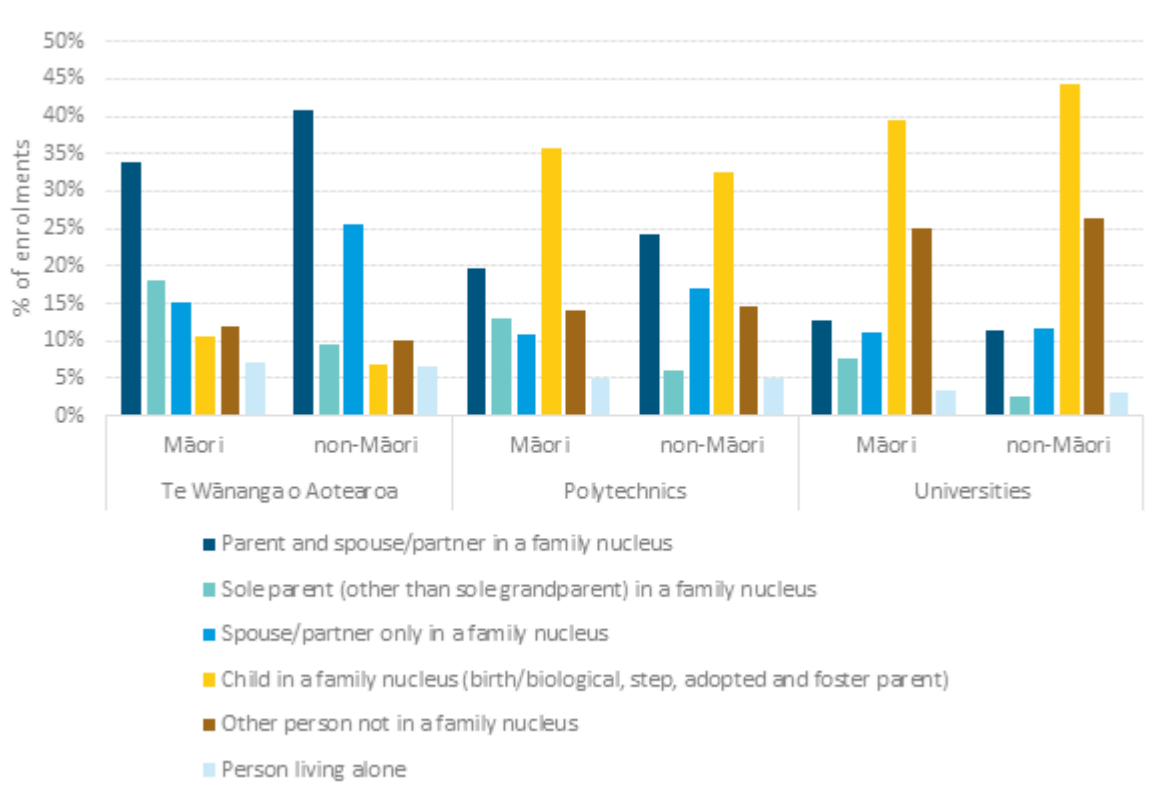


Figure 7. Proportion of Māori and Non-Māori Tauira Enrolments in 2018 Broken Down by Family Role (Census 2018) and Type of Tertiary Institution *Source: Stats NZ IDI*

Census data can provide further insights into the details of what the caregiving responsibilities for tauira at TWoA might involve. Figure 23 shows us that within TWoA, a higher proportion of tauira Māori have children (around 50%) compared to non-Māori (around 30%). Tauira Māori are also more likely

to have young (4 years and under) children (1 child: 14%; 2 children: 5%; 3 – 4 children: 1%) than non-Māori tauira (1 child: 10%; 2 children: 2%; almost no non-Māori enrolled at TWoA have 3-4 children).

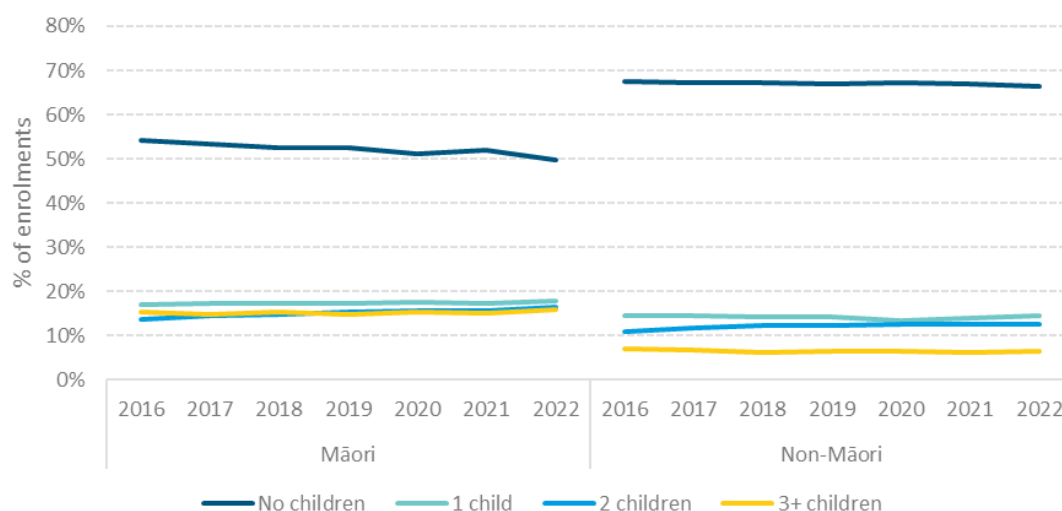


Figure 8. Proportion of Māori and Non-Māori Tauira Enrolments at TWoA Over Time Broken Down by the Number of Children Tauira Have at the Time of Enrolment Who Are 18 Years and Under (Children Born in New Zealand) Source: Stats NZ IDI

Figure 9 uses IDI data to show how course completions for tauira might be affected by family status. For both Māori and non-Māori tauira, those who are a “parent and a spouse/partner” or a “spouse/partner” in the family nucleus are slightly more likely to complete their enrolled course, compared with tauira with other family/living status.

Tauira who are sole parents, who are a child in the family nucleus, or who are living alone have lower rates of course completion. In particular, non-Māori tauira who are a “child in a family nucleus” have the lowest completion rates.

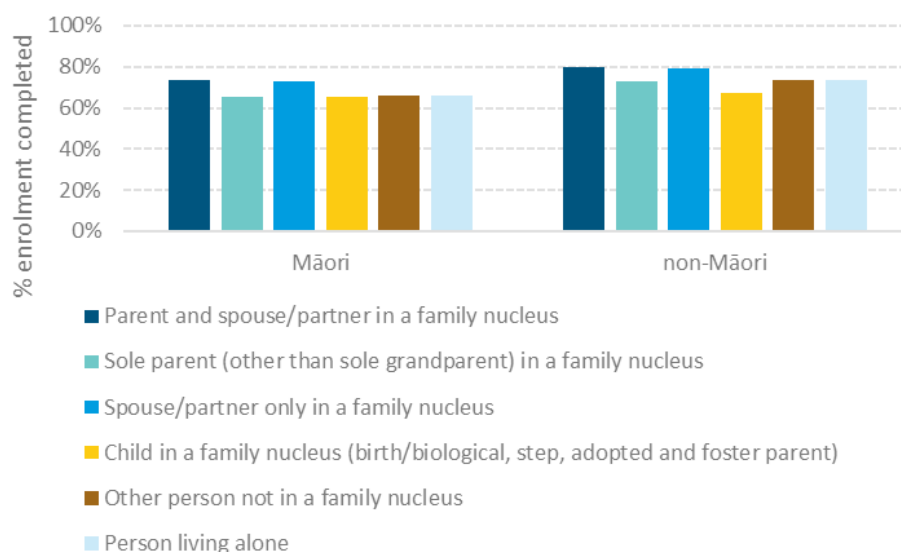


Figure 9. Proportion of Enrolments Completed for Māori and Non-Māori Tauira Broken Down by Family Role (First Enrolment in 2018 and Census 2018) Source: IDI data.

Tauira who have children aged 4 or under (Figure 10) are typically less likely to complete a course when compared with those who have no children. This effect is larger for tauira Māori than for non-Māori. Since this finding does not consider family status (e.g. parent living with a spouse versus sole parent) – which was previously shown to differ for Māori and non-Māori – there are likely to be intersectional effects where multiple factors are at play and which could be investigated in further work, in particular once new data is available from Census 2023.

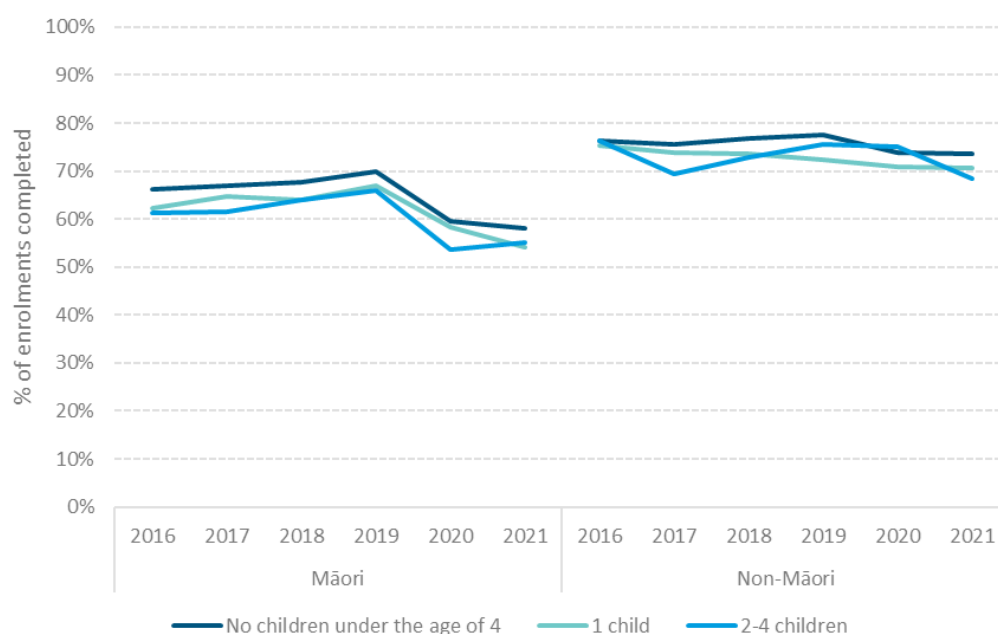


Figure 10. Proportion of Enrolments Completed for Māori and Non-Māori Tauira Broken Down by the Number of Children Tauira Have at the Time of Enrolment Who Are 4 Years and Under (Children Born in New Zealand) Source: IDI data

Indications of Tauira Success or Whānau Transformation Post-Enrolment at TWoA

We also explored whether post-enrolment outcomes differ for tauira Māori and given TWoA's state vision of "Whānau Transformation through Education" we wanted to understand whether any of these outcomes have an element of whānau transformation.

Enrolment in tertiary education is hoped to lead to positive outcomes for students. One commonly considered post-education outcome is change in employment and income as tauira turn their educational experiences into improved employment opportunities. Looking wider than outcomes for individual tauira, we might also hope to see changes for family members of tauira post-enrolment. This could manifest as family members subsequently enrolling in further education themselves.

Income

We used IDI data to analyse the income of tauira at TWoA in the period immediately preceding, and then immediately following, the year of their first enrolment at TWoA (one year prior to enrolment and up to 2 years post-initial enrolment).

Figure 11 outlines the difference in the absolute value of wages and salary income for tauira at TWoA pre- and post-enrolment. Both groups experience income growth, post-enrolment; the absolute value

of that growth is similar for both tauira Māori and non-Māori. For the period of study (2016 – 2022) both Māori and non-Māori have also experienced underlying growth in pre-enrolment wages and salaries income. However, Māori have experienced slower growth in pre-enrolment wages and salary compared with non-Māori. Despite, or possibly even because of, beginning at lower income levels prior to enrolment, the relative growth in income for tauira Māori is typically larger than for non-Māori.

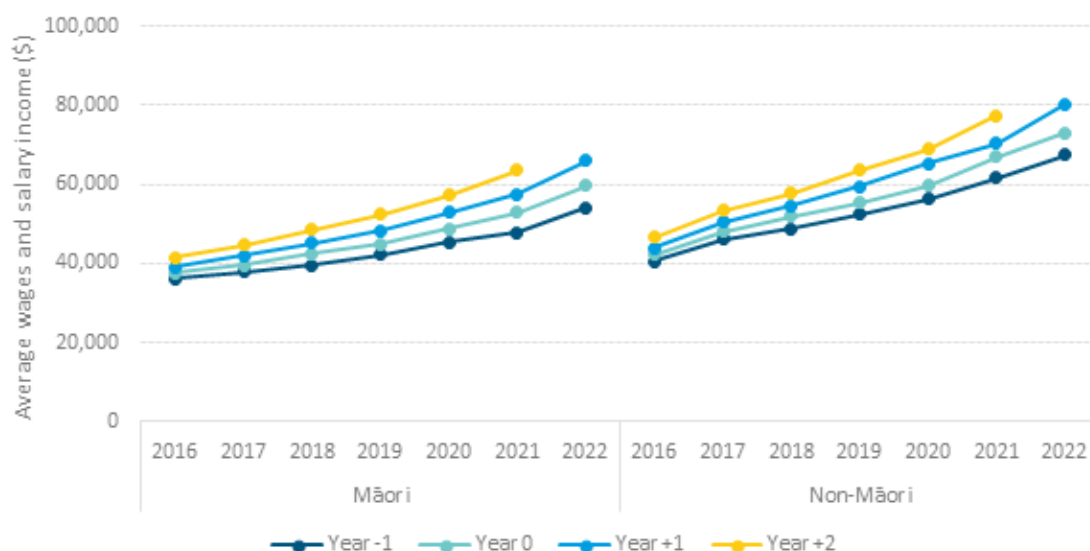


Figure 11. Average Wages and Salary Income a Year Prior to First Enrolment up to 2 Years After First Enrolment for Māori and Non-Māori Tauira by Year of Enrolment (Inflation Adjustments Have Not Been Applied) Source: Stats NZ IDI

Figure 12 shows that tauira Māori experience a change (from 1-year pre-enrolment to 2 years post initial enrolment) in income that is about five percentage points higher than the increase seen for non-Māori. This suggests that for tauira Māori, enrolment at TWoA helps towards reducing the size of a growing income gap between Māori and non-Māori.



Figure 12. Average Wages and Salary Income a Year Prior to First Enrolment up to 2 Years After First Enrolment for Māori and Non-Māori Tauira by Year of Enrolment (Inflation Adjustments Have Not Been Applied) Source: Stats NZ IDI

Enrolment at TWoA also appears to contribute to a reduction in the number of those who receive no income, with this effect being greater for tauira Māori. Figure 16 shows that more tauira receive an income two years post-enrolment compared to a year prior to their first enrolment. The size of this effect changes over time – ranging from a 4% reduction to a 12% reduction in the number receiving no income for non-Māori. For tauira Māori this effect size is typically larger with a reduction of up to almost 20% observed in one year and typically a reduction of three to four percentage points more than what is observed for non-Māori.

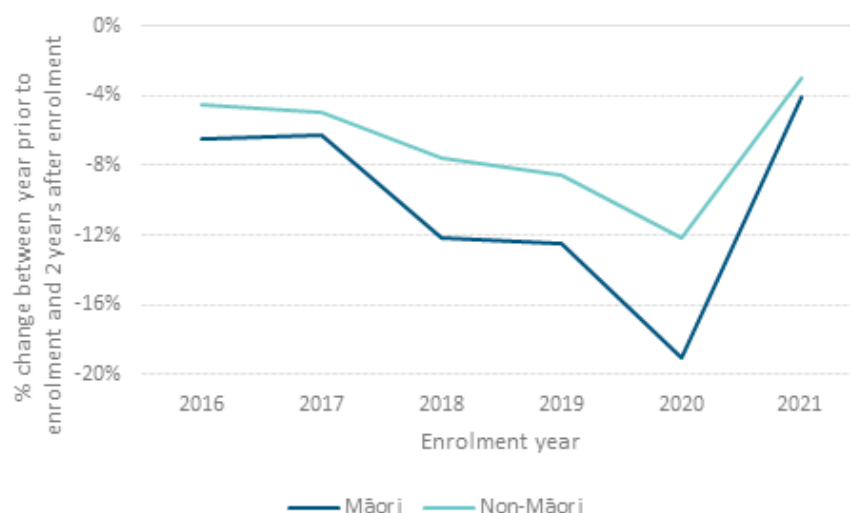


Figure 13. Percentage Change Between the Number of Tauira With No Income (All Sources) a Year Prior to First Enrolment and 2 Years After First Enrolment Broken Down by Māori and Non-Māori Tauira Over Time Source: Stats NZ IDI

IDI data also shows that those tauira Māori who complete a course at TWoA are more likely to receive income from wages and salary two years post-enrolment, compared with those who did not complete the course that they enrolled in (Figure 14).

While it is not possible to directly infer causality from this finding in isolation – that is, it doesn't tell us about a change in receiving wages and salary - when combined with the previous result from Figure 13 on reduction in the number of tauira receiving no income, it suggests that for tauira Māori, completing a course at TWoA leads to an improvement in employability and increased earning potential.

In contrast, there is little-to-no-difference in the fraction of non-Māori receiving income from wages and salary post-enrolment, when comparing those who complete versus did not complete their course at TWoA.

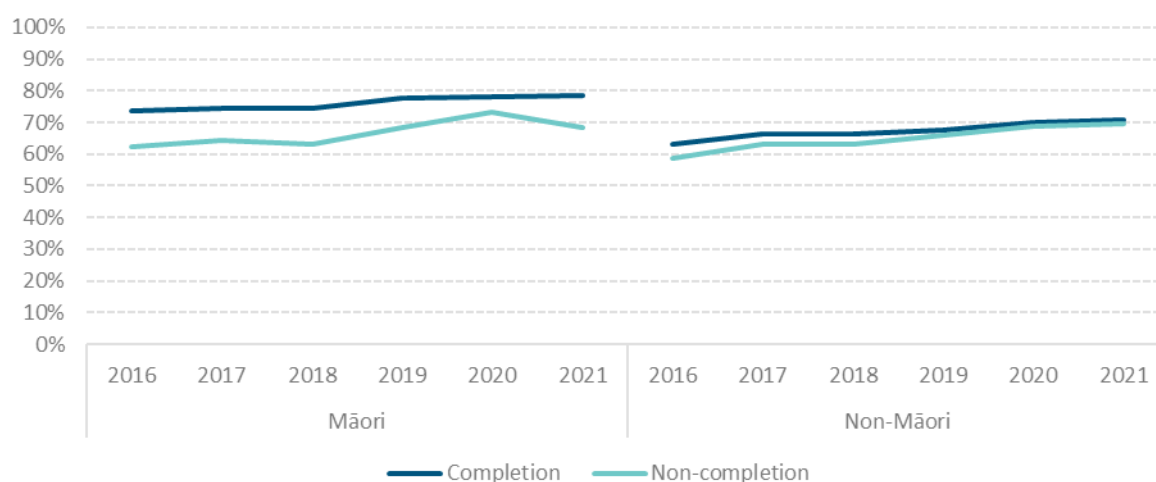


Figure 14. Proportion of Tauira Aged 20 to 64 Years Receiving Wages and Salary Income 2 Years After First Enrolment by Māori and Non-Māori, Enrolment Completion Status and Year of Enrolment

Age is calculated at the time of first enrolment. Source: Stats NZ IDI

Tauira Māori who complete courses at TWoA earn nearly \$10,000 more annually two years post-enrolment compared to those who don't complete, whilst the completion premium for non-Māori is smaller and sometimes negligible despite higher overall wages. This suggests course completion has a more transformative income impact for Māori than non-Māori, possibly because non-Māori may enrol in different course types or already have higher baseline earning potential.

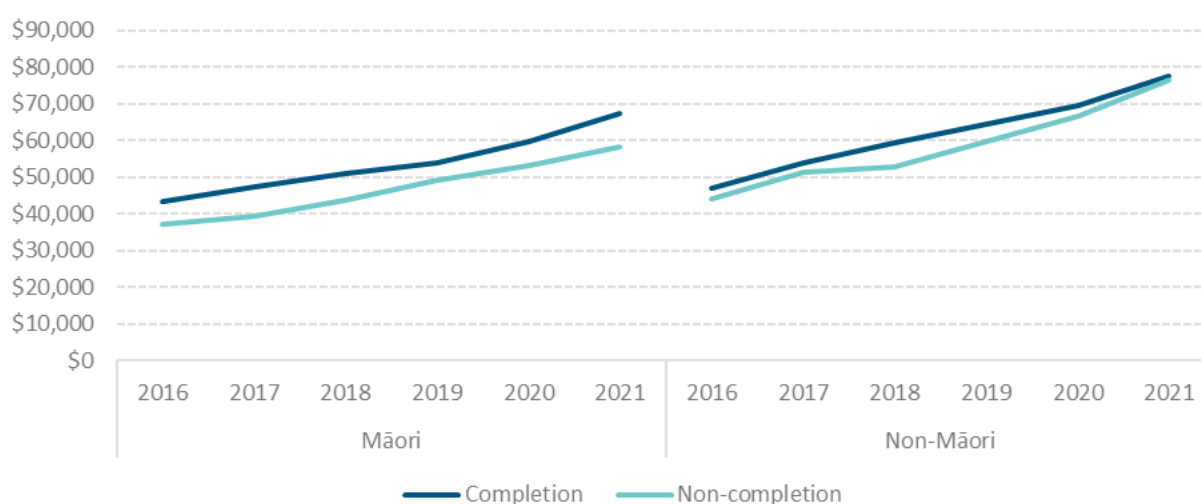


Figure 15. Average Wages and Salary Income 2 Years Post-Enrolment for Tauira Aged 20 to 64 Years by Māori and Non-Māori, Enrolment Completion Status and Year of Enrolment

Note. Age is calculated at the time of first enrolment. Source: Stats NZ IDI

Of tauira Māori (excluding tauira aged 65 years and over) enrolled at TWoA between 2019 and 2021, about 34% receive the benefit⁶. This is higher than for non-Māori tauira (14-15% in the same period). This can be seen in Figure 16. However, two years post-enrolment, of those tauira Māori (excluding tauira aged 65 years and over) that received the benefit, slightly over 50% of them earn wages and

⁶ Type of benefits included: Jobseeker support; Emergency benefit; Sole parent support; Supported living payment; Young parent payment; Youth payment. Does not include student allowance.

salary. This is higher than for non-Māori tauira where slightly under 50% of them earn wages and salary 2 years post their enrolment. Similar to the previous finding regarding changes in wages and salary, this suggests that tauira Māori at TWoA are more likely to benefit from increased employment opportunities post-enrolment, when compared with non-Māori tauira.

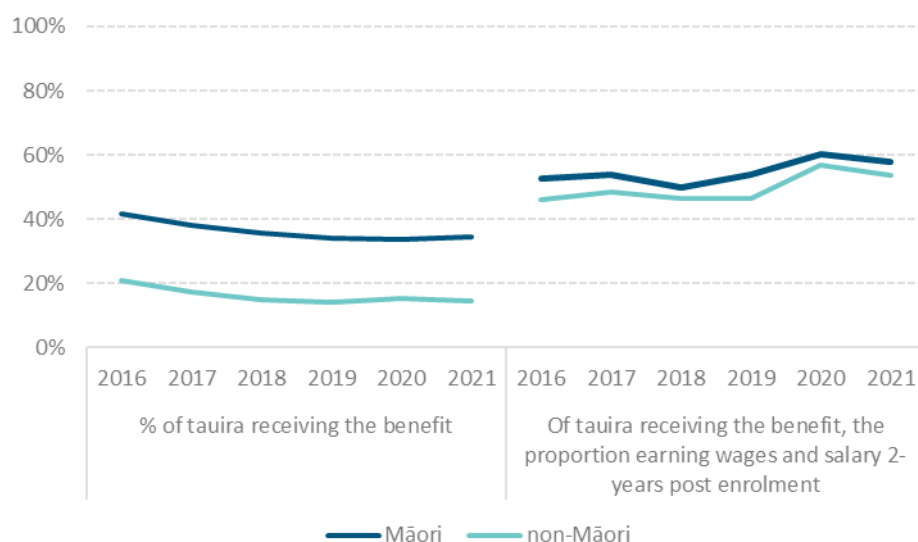


Figure 16. Proportion of Tauira at TWoA Receiving the Benefit and of Those Tauira Receiving the Benefit, the Proportion Earning Wages and Salary 2 Year Post-Enrolment Broken Down by Māori and Non-Māori (Excluding Tauira Aged 65 Years and Over) Source: Stats NZ IDI

Whānau transformation – enrolment of other household members

Most tauira at TWoA (about 90%) are the only person from their family⁷ who is enrolled at TWoA at any given time. This pattern of sole versus concurrent enrolment with family is the same for both tauira Māori and non-Māori (Figure 17). However, tauira Māori are around twice as likely as non-Māori to have a family member enrol in a later year - approximately 10%, compared to around 5% for non-Māori. Tauira Māori are also slightly more likely than non-Māori to have family members who were enrolled at TWoA in the same year as them and enrolled later (9% compared with 7%).

This implies that enrolment at TWoA for tauira Māori is more likely to lead to benefits beyond the individual, with whānau engaging with TWoA in future years.

⁷ In this context “family” means nuclear family living in the same household – as used in the Stats NZ Census. As such, these results give a narrower scope of whānau transformation than they otherwise might if a more inclusive interpretation of whānau was possible with available data.

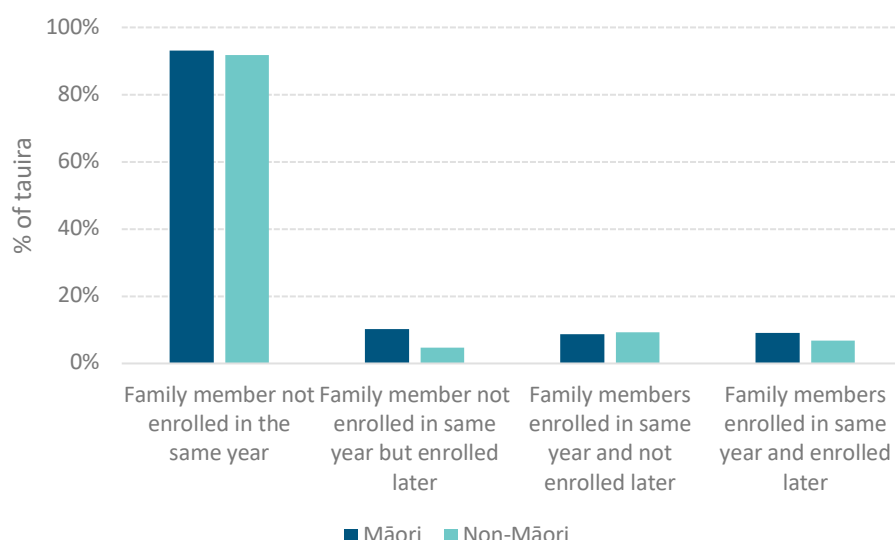


Figure 17: Proportion of Tauira With Family Members Also Enrolled at TWoA in 2018

Note. Proportions add up to more than 100%. This is because tauira can have multiple family members and they can be part of different groups. Source: Stats NZ IDI – Census 2018

Having established the distinctive characteristics of TWoA's tauira population and demonstrated compelling evidence of transformative positive outcomes, this discussion examines the profound disjuncture between these nuanced realities and the reductive metrics employed by the Crown to evaluate educational success and allocate tertiary funding.

WESTERN NOTIONS OF SUCCESS

Western educational success prioritises individual accomplishments, competition, material wealth, and social status (Hoani, 2025). In academia, success is measured through quantifiable achievements: grades, awards, and publications (York et al., 2015). The Tertiary Education Commission exemplifies this approach through Education Performance Indicators (EPIs):

- First Year Retention Rate
- Course Completion Rates
- Progression Rate
- Cohort-Based Qualification Completion Rate

However, BERL (2014) noted these metrics "do not measure the contribution that individual Wānanga make as providers of Māori programmes" nor acknowledge their role in "promoting and growing Māori language, knowledge and culture." (BERL, 2014, p. 6).

- *First Year Retention Rate*: the percentage of students who continue into the second year of study
- *Course Completion Rates*: the percentage of students who complete individual courses
- *Progression Rate*: the percentage of students who move from one level of education to the next
- *Cohort-Based Qualification Completion Rate*: the percentage of students who complete their qualification within a specific cohort

According to Weatherton & Schussler (2021), definitions of success:

are most often created and maintained by those who hold power in the field ... and rarely include meaningful student input, especially from minoritized populations. If these definitions are not created by and for a diverse population, then there will be cascading impacts on outcomes for those left out of the conversation. (p. 2)

INDIGENOUS NOTIONS OF SUCCESS

There is a chasm between educational success as defined by governments and consequently policy and practice and how Indigenous students define and experience success. Indigenous definitions of success extend beyond narrow academic metrics. Hughes et al. (2025) argue that improving outcomes for Indigenous students requires looking beyond current narrow targets, whilst the OECD (2017) advocates for broader criteria including strong cultural identity and confidence.

Smith (2003) reminds us that we need to challenge and reclaim equity, and by extension success definitions, from the neo-liberal economic hegemony that advocates against forms of equity that reinforces the status quo. From an Indigenous perspective, there is a need for a more holistic, culturally responsive understanding of student success that goes beyond traditional metrics like grades and retention. This involves considering students' social, emotional, and cultural needs alongside their academic preparedness.

Multidimensional definitions of success recognise that student success cannot be captured by a single metric or dimension. Instead, it encompasses a variety of factors that contribute to a student's overall wellbeing and achievement. Korhonen et al. (2019) describe these dimensions as:

- *Academic*: Reflects a student's ability to meet educational standards and excel in their studies
- *Social*: Ability to form relationships and engage meaningfully with peers, faculty, and the broader community
- *Emotional*: Focuses on student's health and mental wellbeing
- *Cultural*: Ability to navigate and integrate one's cultural background within the educational environment, fostering a sense of belonging and pride in one's cultural heritage
- *Personal*: Individual growth and self-fulfilment

Fostering a strong sense of cultural identity is essential for Māori and significantly impacts life outcomes. For example, rangatahi Māori who have a strong cultural identity are more likely to experience good mental health outcomes (Williams et al., 2018). Webber and MacFarlane (2020b) highlight that tauira Māori academic engagement and social-emotional wellbeing improves when educators focus on connectedness to their cultural identity. Therefore, it could be argued that the embedding of te reo and tikanga Māori within TWoA programmes, plays a fundamental role in increasing tauira Māori educational participation.

Student success can be defined as behaviours aiming to accomplish academic goals, such as persistence in higher education and course or degree completion (Crisp et al., 2015). For governments and other institutions, success is often gauged by the number of students who graduate. Therefore, understanding the factors that contribute to student achievement, underachievement or withdrawal from tertiary education can offer valuable insights for education providers and help address disparities (Eather et. al., 2022).

Towards An Understanding Of Student Success And Achievement

A substantial body of literature has explored various factors that influence student success in higher education. These include but are not limited to racism, privilege, financial stability, health (including mental) and academic preparedness, with studies consistently demonstrating the strong relationship between high school performance and university outcomes (Danilowicz-Gösele et al., 2014; Hepworth et al., 2018).

Higher education institutions have developed some approaches and initiatives aimed to address and improve the multifaceted issue of student outcomes. One prominent framework is Tinto's (1997, 2017) model of student persistence, which emphasizes the importance of academic and social integration, as well as institutional commitment, in fostering student success.

Kuh et al.'s (2006) comprehensive literature review posited that clear expectations, timely support, effective teaching practices, and a focus on educational quality are all important in contributing to positive student outcomes. Institutions that adopt a holistic, student-centered approach and align their policies, programs, and resources to address the diverse needs of the student population are more likely to see positive outcomes. Additionally, they noted that targeted interventions and support services can play a crucial role in promoting student success, particularly for underrepresented and at-risk populations. Examples include early alert systems to identify and support struggling students (Lizzio & Wilson, 2013), peer mentoring and tutoring programs (Byrom, 2018), and culturally responsive curricula and pedagogies (Castagno, Solyom, Brayboy, 2020; Frawley 2020).

The following diagram (Figure 18) and Table 1 represent the range of factors that impact on tauira success, some within a tertiary organisations control and some not. This complexity is not currently considered in the funding models used by TEC. The diagram also proposes actions for the TEO (in this case TWoA) and the government to support tauira Māori success.

Table 1. Factors which influence Tauira Māori success at Te Wānanga o Aotearoa

Group	Examples
Factors within the control of Te Wānanga o Aotearoa	The learning environment including support systems for tauira Māori
Factors outside of the control of Te Wānanga o Aotearoa	Societal inequities in terms of health, economy, caring and work responsibilities that may make it difficult for tauira Māori to engage in learning at Te Wānanga o Aotearoa
Factors influenced by external mechanisms	Compliance measures and (over) monitoring of Te Wānanga o Aotearoa shifts the focus from supporting tauira, whānau and Wānanga-defined measures of success, toward meeting Crown-defined targets
Factors which require external support	Definitions of tauira Māori success are limited and shaped by the TEC Inadequate funding of Te Wānanga o Aotearoa

Tauira Māori arrive at our door already impacted by factors that stem from inequities in wider society. These can (pre)determine their outcomes in terms of the TEC narrowly defined notions of student achievement.

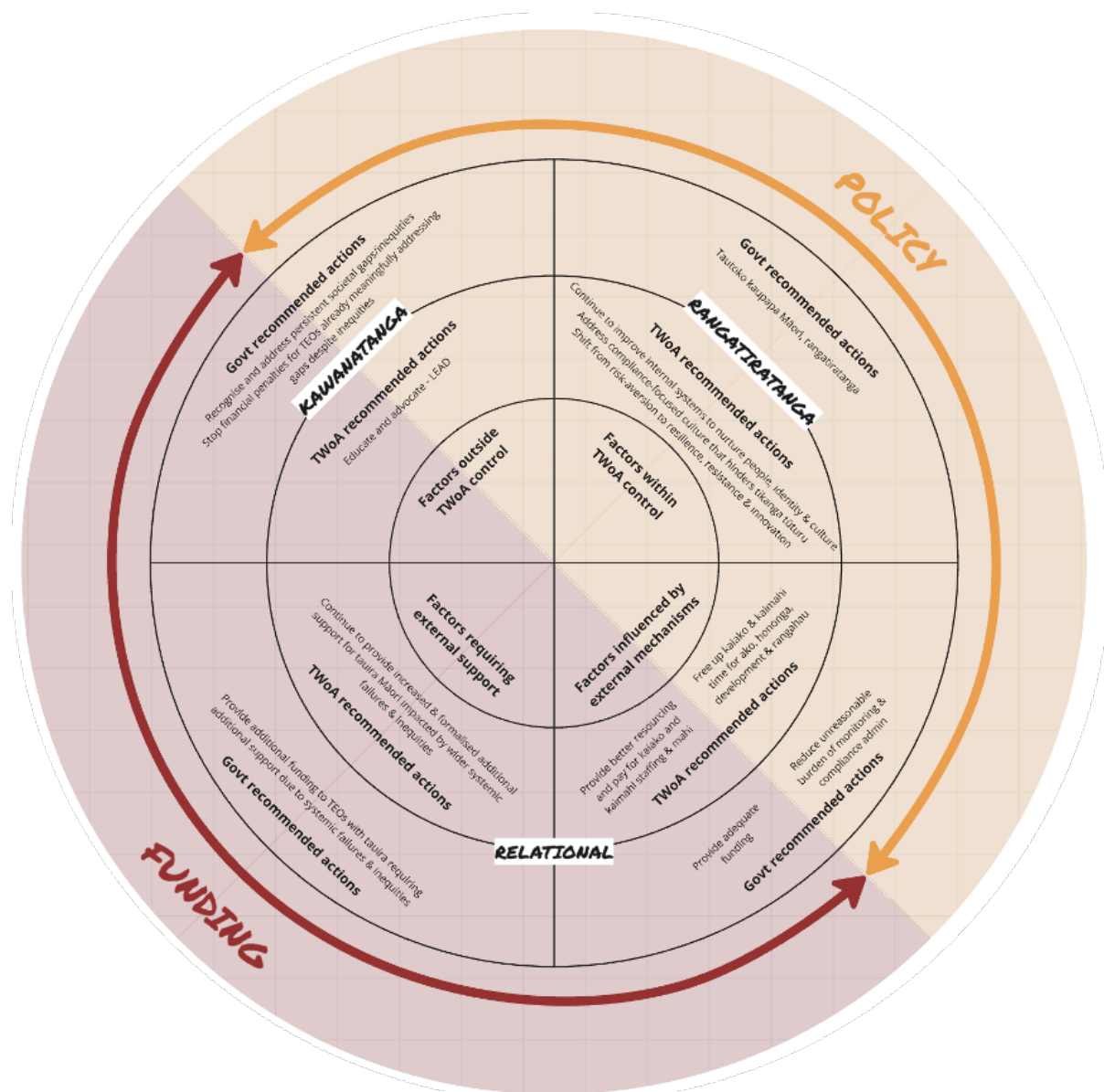


Figure 18. A conceptualisation of factors that influence tauira Māori success within Te Wānanga o Aotearoa
Designed by Jen Archer-Martin

Government regulations may impede tauira Māori success by overlaying Western institutional models onto Indigenous contexts. Tying funding solely to completion, graduation, retention, and progression rates disserves both Wānanga and tauira-defined success.

The current model is problematic because it:

- Fails to recognise TWoA's unique demographic and required additional resourcing
- Over-burdens kaimahi with compliance rather than supporting tauira
- Creates risk-averse management culture prioritising Western systems over tikanga-centric policies
- Ignores “distance travelled” by tauira Māori and “value added” by Wānanga

While disparity measures may incentivise mainstream institutions with majority non-Māori students, they may have opposite effects for Wānanga. Rather than recognising what Wānanga do for Māori—

widening participation, providing safe cultural learning spaces, generating positive wellbeing outcomes—the model focuses on prevailing gaps even when overall participation exceeds universities.

Unless underlying inequities affecting tauira Māori before they reach TWoA are addressed, gaps will persist. We argue that the burden should not fall on Wānanga and kaiako to prove they're not failing tauira Māori, but on government and funding bodies to demonstrate that wider systems aren't at fault.

International Precedent for Alternative Measures of Success

There are alternatives. Four international models demonstrate alternatives to completion-based tertiary funding: Finland allocates approximately 12% of university funding through negotiated performance agreements rewarding societal contributions, regional development, and distinctive institutional profiles (Ministry of Education and Culture Finland, 2019; Kivistö & Kohtamäki, 2016); Australia's Indigenous Student Success Programme uses culturally appropriate measures including community engagement and Indigenous knowledge integration (Department of Education, Skills and Employment, 2020; Universities Australia, 2019); the Netherlands directs approximately 7% of education funding through quality agreements incorporating student experience evaluations and teaching quality assessments (de Boer et al., 2015; Kearney, 2019); and Ontario employs Strategic Mandate Agreements allowing institutions to negotiate performance indicators aligned with their specific missions and student populations (Ministry of Colleges and Universities, 2019; Weingarten et al., 2019). While each model faces challenges including administrative complexity, measurement difficulties, and implementation variations (Dougherty & Reddy, 2013; Kelchen, 2018), all successfully demonstrate that funding systems can incentivise equity, quality, community impact, and student experience beyond narrow completion metrics, requiring significant institutional capacity, stakeholder buy-in, and careful balance between accountability and autonomy for effective implementation (Hillman et al., 2015; de Boer et al., 2015).

CONCLUSION

This research reveals fundamental tensions between government-defined educational metrics and tauira Māori achievement realities at TWoA. The institution serves a demographically distinct population—predominantly female, older, and Māori—who face significant challenges including chronic health conditions, caregiving responsibilities, and justice system experiences. Despite these complexities, the study demonstrates positive transformation outcomes extending far beyond traditional academic metrics.

Current Crown-mandated Educational Performance Indicators fail to capture holistic benefits constituting success within kaupapa Māori contexts. Whilst government metrics focus on completion rates, tauira Māori define success through cultural reclamation, whānau transformation, and collective advancement. This creates a paradox where an institution designed to serve Māori learners is evaluated using contradictory Western frameworks.

The quantitative analysis reveals tauira Māori experience greater relative income improvements post-enrolment compared to non-Māori students, whilst being twice as likely to have whānau members subsequently enrol—effects invisible to government performance indicators.

The findings demonstrate urgent need for funding mechanisms recognising wānanga demographics and transformative outcomes. Current performance-based models penalising institutions serving students with complex needs are inequitable and counterproductive. The research supports

differentiated accountability frameworks allowing wānanga to demonstrate success according to their missions and community aspirations.

For TWoA specifically, the institution's success generating positive outcomes for barrier-facing tauira should be recognised and supported rather than penalised through funding reductions based on completion rate disparities.

Sustainable improvement requires systemic change addressing underlying societal inequities rather than placing responsibility solely on educational institutions. The complex circumstances of TWoA tauira reflect broader patterns of colonisation and structural racism requiring coordinated action across health, housing, employment, and social services.

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Authors' Contributions (CRediT)

All authors contributed to the conceptualization, methodology, writing of this paper. In addition, Dion O'Neale led the data visualizing and analysis. Rebecca Kiddle led the original draft preparation. All authors have read and agreed to the published version of the manuscript

Sustainable Development Goals (SDGs)

This study is linked to the following SDG(s): Good health and well-being (SDG 3), Quality education (SDG 4), Reduced inequalities (SDG 10), Peace, justice, and strong institutions (SDG 16), and Partnerships for the goals (SDG 17).

Authors' Notes

The introduction, the conclusion and the literature review of this paper were generated with the assistance of Claude Sonnet 4 (August 2025) and later edited by human authors. The literature review is a summary of a larger literature review done for the broader study. These sections were subsequently reviewed, critically edited, and validated by the human authors to ensure academic rigor and adherence to ethical standards. The authors also assessed and addressed potential biases inherent in the AI-generated content. The final content in these sections is the sole responsibility of the human authors.

Data Accessibility Statement

The data that support the findings of this study are available from the New Zealand government but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available.

Ethics And Consent

Ethics was obtained for the work described in this article through **Te Wānanga o Aotearoa**

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Site-Centric Augmented Learning for Personal Experience in Outdoor Environments

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ABSTRACT

Field excursions have historically been integral to the pedagogy of land-based disciplines in universities. Site-centric learning, however, is becoming seriously challenged due to time and budget constraints for both students and universities. There are few effective models which educators can draw upon to easily develop site-based resources for formal learning contexts. Peek™ is one such model and is a mobile software application that provides asynchronous communication along defined paths using digital text, images, videos, audio clips and interactivity on mobile devices, offering an interpretative walking guide for students as constructed by educators.

This study captures students' answers to questions posed on a Peek™ field excursion with feedback and reflections after the scheduled site visit and after their completed project work. The site is a coastal subdivision built over a Ngāi Tūāhuriri battlefield near Kaiapoi Pā at Pegasus Bay, near Christchurch in Aotearoa New Zealand. Students found the self-paced guided experience around each site both helpful and fun. Peek™ allowed an educator to focus students' attention on specific aspects of a complex outdoor environment to produce lasting knowledge of relevance to them. A major strength of augmenting learning with Peek™ is that it allows for multiple perceptions of place to appear at the same time, assisting students to learn more effectively through their own personal experience. One weakness of this approach is the physical absence of the teacher or guide on the journey which one student found challenging compared to traditional teacher-led learning.

Keywords

Site-centric learning; field excursions; mobile software application; outdoor environments; Peek; digital technology; teacher-led learning; student experience; place perceptions; landscape architecture.

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INTRODUCTION

Problem of Field Excursions

Many students in land-based disciplines, such as landscape architecture, agriculture, ecology, geology, tourism, among others, benefit from field excursions outside the classroom. These benefits include authentic, relevant and memorable experiences, learning cultural practices and values, sustainability in action, ecological immersion through exploration, local Indigenous perspectives in context, site perception through way finding and seasonal change in specific learning contexts.

However, learning *in-situ* can be highly dynamic, complex and confusing for learners who may have little knowledge of how to focus their attention and achieve their specific learning outcomes. It can also be costly, challenging time commitments and budget constraints of both students and institutions (Kerr and Lawson, 2019; Smith, 2004). A potential solution to address these challenges is for students to independently explore environments, guided by designed resources, at their own pace and discretion, using an accessible and portable technology that is commonly used by most (if not all) students - only requiring low-cost digital data and a mobile connection.

Augmented learning using mobile software applications

Augmented learning is an educational approach in which technology is employed to enhance learning experiences within specific contexts, enabling learners to engage more deeply with content and environments. While virtual reality (VR) and augmented reality (AR) are often associated with augmented learning, other technologies can integrate location-based tagging, situated information and collaborative engagement with physical objects and specific sites (Chou and Chanlin, 2014). In this way, technology does not replace the real-world experience but enriches it by providing contextually relevant information and interactive opportunities directly on site.

There are few effective software applications for educators to easily develop site-based resources for field work. Peek™ is a mobile software application that provides asynchronous communication along defined paths using digital text, images and interactivity on mobile devices, offering an interpretative walking guide for students as constructed by educators. Teaching staff complete a template of introductory text, set geolocated questions and answers and provide feedback to each student individually. Thus, some degree of reciprocity between students and teachers is built into the application.

Purpose of This Study

This study aims to investigate how a mobile software application, Peek™, can be used as a reciprocal, inclusive, scalable and sustainable tool for site-centric learning in landscape architecture and how that tool can change student knowledge and awareness of the landscape. To achieve this aim, the following objectives are undertaken:

- develop a theoretical framework for site-centric learning;
- establish data collection and analysis procedures using a software application; and
- evaluate learning outcomes and teaching opportunities using a software application on mobile devices.

Contribution of Paper

This work contributes new knowledge to the field of site-centric learning where field excursions supplement classroom-focused education. It reflects on the effectiveness of how students and their teacher apply intended knowledge in the physical world with the help of the digital world. It addresses the development of students' shared experiential knowledge in shaping their connections to places in the physical world and the ways that a teacher learns to understand this.

LITERATURE REVIEW

What is Site-centric Learning?

Site-centric learning, otherwise called field-based learning, is where a curriculum involves students and teachers leaving the classroom and learning through first-hand experience (Boyle et al., 2007). It involves teaching concepts through direct interaction with a site outside the classroom or laboratory. This can have several benefits, including presenting materials, objects or phenomena that are otherwise inaccessible to students; stimulating a deeper understanding and reinforcement of decontextualised knowledge in a real-world context; and strengthening an appreciation for, concern or valuing of the visited physical or cultural environment (Loneragan & Andresen, 1988). There can also be challenges including the extra effort in leaving the comfort of the classroom; dealing with large student numbers; extra expenses with declining budgets; inequity of extra costs being passed on to students; access for students with disabilities; limited time for teaching staff to prepare field work resources; and safety risks and legal implications of accidents off campus (Boyle et al., 2007). Research studies have identified that augmented learning applications frequently enhance learning and increase students' motivation, engagement and effectiveness (Kleftodimos et al., 2023). But why might this be the case? Few studies connect software applications to learning and teaching theories but those that do focus on constructivist and experiential learning approaches.

How Do Software Applications Help with Learning?

Constructivist learning is the way that students actively build and construct knowledge by assimilating newly received knowledge with previously acquired knowledge (Hajirasouli & Banihashemi, 2022). Bächtold (2013) argues that constructivism is rooted in two fields. The first is a psychology of cognitive development based on Piaget's description of 'spontaneous' concepts, assumed to be constructed by students on their own. The second is an epistemology of conceptual development at the symbolic level, based on Vygotsky's description of abstract concepts, assumed to be introduced by the teacher. The common ground has been that learning new knowledge requires the active involvement of the learner to construct this knowledge. We question whether the use of a mobile software applications can facilitate the active involvement of each individual student by scaffolding their observation, reflection and response to a situated problem.

As constructivism is based in part on Piaget's cognitive development at a personal level and in part on Vygotsky's conceptual development at a social level, it is not surprising that active learning occurs through social interaction and collaboration with peers, helping students to grasp and understand new information and solve problems from different perspectives (Andalib & Monsur, 2024). We ask the question whether the use of a mobile software application is another way of bringing together a student's new and prior knowledge by combining their own interactive experience of a situated problem with that of others in a group of their own choosing. We assume that feeling confident in

sharing their own questions and responses with their peer group could help build their own cognitive framework to accept new ways of understanding a particular phenomenon.

Bächtold (2013) advocates that to construct knowledge, there are two important steps to follow: (1) elicit students' prior conceptions on the topic being taught, and (2) create a cognitive conflict in students' minds that confronts their prior conceptions of new phenomena. Teachers must then deal with these prior conceptions and then 'change' them and overcome any 'difficulties' associated with them. It seems then that students must reconstruct what they previously constructed for themselves and then integrate what is imparted by the teacher. In so doing, they construct new cognitive structures or frameworks to accept and assimilate new knowledge. Furthermore, each new cognitive structure must be used numerous times by students to become stable, durable and automatic (Bächtold, 2013). We ask whether the use of a mobile software application can assist in this by combining multisensorial experiences sequentially, in both real and virtual worlds, which change in location, time and circumstance, thereby continually engaging students with educational concepts and the physicality of their experiences.

Experiential learning is where students practise using acquired knowledge by interacting with a relevant environment. They are encouraged to create and manage their own learning process, taking responsibility for their own observations, reflections and applications in new environments. It emphasises independent judgement, critical and free thinking (Hajirasouli & Banihashemi, 2022; Huang et al., 2016). Unsystematic or disorganised experiences can result in low learning effectiveness (Huang et al., 2016). We question if a mobile software application can provide a structured, well-organised, logical set of experiences for students that 'makes sense' as they navigate unfamiliar environments.

New materialism is where dualistic and hierarchical ways of thinking are being re-evaluated and reconstructed in education (Jukes & and Lynch, 2024). New materialists embrace the breakdown of the separation of animals, humans and things in the material world, giving agency to human and more-than-human existences in a technologically entangled way of life. In site-centric learning, students can learn to understand more-than-human places as vibrant worlds of multiple relations that coalesce and produce sensations that change the bodily experience. Relational ways of decentering humans with other entities seems to align well with Indigenous knowledge of co-productivity and mutually constructive conceptions of the world (Jukes & and Lynch, 2024). We wonder whether the use of a mobile software application can help students traverse bicultural/multicultural learning and teaching environments, particularly in dynamic and complex site contexts where indigenous voices are needed but scarce.

Kaupapa Māori is a theory and approach that encompasses Māori processes for generating knowledge and applying this in the delivery of Māori services to communities in Aotearoa New Zealand (Borell et al., 2020). Within Kaupapa Māori, the notion of Ako encompasses a dynamic teaching and learning relationship wherein educators do not only impart knowledge, but actively engage in learning from their students (Shadbolt et al., 2024). Ako is founded on the principle of reciprocity and acknowledges the inseparable connections between the learner, whānau (family) and their community. We question if using a mobile software application could potentially be a means of giving and receiving knowledge between students and their teacher in relational outdoor settings.

METHODS

Site Selection

The Peek™ field excursion was evaluated in a second-year course on *Landscape Planting Practice*. This course aimed to develop knowledge and understanding of the techniques, issues and methods required for the successful preparation and implementation of planting proposals in landscape architectural professional practice. This field excursion for *Landscape Planting Practice* took place at Pegasus township, a coastal subdivision built over a Ngāi Tūāhuriri battlefield near Kaiapoi Pā at Pegasus Bay, 30 km north of Christchurch in Aotearoa New Zealand (Figure 1a and 1b). This site was selected based on: (1) being less than one hour for students to self-drive to the site; (2) involving a landscape architect, urban developer, landscape contractor, plant nursery supplier, and Council officer who could explain their part in the project to students; (3) having coastal landforms and natural processes that differed to the local area of the university; and (4) showing how the site's cultural history influenced the design and construction of the subdivision. A second Peek™ field excursion was also set up for a third-year course, *Innovative Design*, on Ōtamahua Quail Island in the takiwā of Ngāti Wheke of Whakaraupō Lyttelton Harbour, as a sequel to the Pegasus project.



Figure 1: Location maps showing (a) Christchurch in the South Island of New Zealand (voanews.com, April 17, 2023) and (b) Pegasus subdivision 30 km north of Christchurch (Google Maps, 2025).

Participants

In 2024, there were 10 students who visited the Pegasus site with their teacher and all of them chose to self-drive to the site on Tuesday 20 August. Two more students had a timetable clash and chose to visit the site on their own on 13 and 26 September. All elected to use the Peek™ app on their mobile phones, although one student seriously damaged her smart phone just prior to coming to the site and had to work alongside other students as they moved from stop to stop. All students were domestic students, enrolled full-time, with one exception being an international exchange student. There were nine females and three males enrolled in the course. The age profile was nine students in the 20-29 years old age range with three respondents who did not answer this question in the Qualtrics survey. In 2025, the same cohort of students visited Ōtamahua Quail Island but only

three responses were recorded as this visit included an in-person kaitiaki (guardian) guide from Ngāti Wheke (the local subtribe) and 30 architectural students from another institution. Students did not have the same need or desire to use the Peek™ app during the field excursion to the island. Hence data analysis was not undertaken for this follow-up trip.

Peek™ Field Excursion Development

Location-based mobile software applications, such as Peek™, present digital media (text, images, videos) to users when they reach specific locations as they move through a physical site. They do this through a mobile device (smart phone or tablet) and by tracking the user's position using GPS (global positioning system) sensors on the mobile device and wifi network (Kleftodimos et al., 2023).

The field excursion for *Landscape Planting Practice* at Pegasus township was set up in four stages:

1. making an initial reconnaissance site visit to identify specific locations, record their latitude/longitude coordinates and create related questions that were relevant to the students' project;
2. completing a Peek™ Word document template where the latitude/longitude coordinates were matched with the types of questions (multiple choice, measurement estimation, open-ended questions, image upload), answers (correct or incorrect) as well as feedback with additional background information for 10 stops in pre-determined order (Figure 2);
3. uploading all stop locations, questions, answers and feedback into the software application; and
4. testing the Peek™ excursion with two colleagues on their mobile phones on 07 Jun 2024 to provide valuable feedback on the useability of walking to and from stops and the questions and answers at each stop (Figure 2).

Instructions for Students

At Pegasus township, students were told to meet the teacher at 9:00 am at the car park outside a central café near the lake. As each student arrived, they were asked to check that the Peek™ app was working on their phone by finding and answering the first question - *If you think about the number of people who might visit this town centre, one way of estimating visitor numbers can be to look at car parking. What do you estimate is the maximum number of cars in this car park? (a) 30-60 cars (b) 61-90 cars or (c) 91-110 cars.* The students quickly worked out how to use the app on site and walked from the car park to the second stop on the bridge, while the teacher remained in the car park to wait for other students to arrive. Once all students had arrived and started the walk, the teacher waited at the central café, watching the students in groups of two or three walk around the lake to stop 6 before moving out of sight for the last four stops. Most students returned to the central location within 30 minutes and were reminded of the research project, then asked for their verbal feedback and written feedback via a short Qualtrics survey. They were also told that there would be a reflective component about their site visit experience in their project work. An independent colleague outside the teaching team administered the survey and consent to use the students' project work. This was done in fulfilling the requirements of Human Ethics Committee approval HEC2024-40. As students returned to the central café in their own time, the teacher invited them to discuss what they had seen and experienced around the site. The discussion then turned to their project work and what progress was expected in the coming weeks.



Figure 2: Location map of Pegasus township showing the 10 stops in a circular loop covering a distance of approximately 3 km, taking 10 students approximately 30 minutes to walk and return to a central café (Google Maps, 2025).

Data Collection

1. Peek™ Questions and Answers

At each stop at Pegasus, students were asked one or more questions based on what they observed in front of them, to assess how much they knew about the landscape that surrounded them (Table 1). There were eleven multiple choice questions, two open-ended questions and two media questions where students uploaded photos they took on site. All answers, including photos were downloaded to Excel spreadsheets for analysis. There were 11 student submissions in total.

Table 1: Questions and answer options in order of travel from stop 1 to stop 10 at Pegasus township.

Stop	Questions	Answer options
1. Carpark outside Good Home Café	1. If you think about the number of people who might visit this town centre, one way of estimating visitor numbers can be to look at car parking. What do you estimate is the maximum number of cars in this car park?	(a) 30-60 cars (b) 61-90 cars (c) 91-110 cars
	2. Do you think this is a natural or man-made lake?	(a) natural lake formed by natural processes such as erosion, deposition and inundation

		(b) man-made lake formed from cut and fill during construction
2. Bridge on Te Kohanga Dr	3. Describe the type of natural landform that you think would have existed here before the town was constructed and before farming took place. Limit your answer to 20 words.	Open-ended question
	4. What kind of natural disaster must have been considered when constructing this town?	(a) river flooding (b) tsunami flooding (c) earthquakes
	5. Where does the water for the lake come from?	(a) underground aquifers (b) tidal estuary (c) river system (d) stormwater runoff
	6. Take pictures looking west to the lake and east to the wetland showing the difference in the water edges.	Images
3. Grass Swale on Te Kohanga Drive	7. Why do you think there are so few plants along Te Kohanga Drive?	(a) too expensive for the developer (b) too much vandalism for the local council (c) poorly drained with water ponding in the swales (d) too dry with water infiltrating into the sandy soil
4. Waterfall on the Island in the Lake	8. Looking around you, can you make a quick estimate of how many plant species are present here?	(a) 0-10 (b) 10-30 (c) 30-50
5. End of Bob's Swing Bridge	9. What do you estimate the total area of open grassland to be here?	(a) 7000 m ² or one rugby field or more (b) 14000 m ² or two rugby fields or more (c) 21000 m ² or three rugby fields or more
6. Plane Trees on Main St	10. Why do you think these plane trees did not survive here?	(a) exposure to salt-laden winds (b) too much air pollution (c) not enough soil moisture
7. Manatu Trees on Aroha St	11. Take pictures of the diagnostic features of a manatu tree i.e. leaves, stems, trunk and flowers (if any).	Images
8. Western Ridge Conservation Area	12. Looking around you, do you think this ridge is a natural or man-made landform?	(a) natural ridgeline (b) man-made ridgeline
	13. Plants in this area include both NZ natives and introduced plants. Both types of plants have to:	(a) adapt to drought conditions (b) cope with high rainfall events
9. Freshwater Wetland on Arahura Rd	14. Do you think this wetland is a natural or man-made landform?	(a) natural wetland (b) constructed wetland
	15. Describe the type of plants that have been planted in the wetland. Limit your answer to 20 words.	Open-ended question

2. Qualtrics Survey

Immediately after the field excursion at Pegasus, students were asked to complete a 5-minute survey (Figure 3) at the café before they departed in order to capture their initial reactions to using the Peek™ app. There were 10 out of 12 respondents with two students who visited the site on alternative

days and did not complete the survey. Three key questions were included in the survey:

Q3. Please rate your level of agreement with each of the following statements about the use of the Peek app for your site visit.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	Prefer Not To Say
I learned how to use the Peek app quickly	☐	☐	☐	☐	☐	☐
Site visits help my understanding of the related assessment	☐	☐	☐	☐	☐	☐
Site visits are an enjoyable way to learn	☐	☐	☐	☐	☐	☐
Using the Peek app is a good way to learn about this location	☐	☐	☐	☐	☐	☐
Using the Peek app will make it easier to remember information about this location	☐	☐	☐	☐	☐	☐
I would like to have more site visits using the Peek app	☐	☐	☐	☐	☐	☐

Q4. Please rank your preference (drag and drop) for site visits from the following options:

- Explore a site on my own with the Peek app
- Explore a site on my own without the Peek app
- Explore a site with other students with the Peek app
- Explore a site with other students without the Peek app
- Explore a site with other students and teaching staff with the Peek app
- Explore a site with other students and teaching staff without the Peek app

Q5. Please explain your ranking in the question above.

Figure 3: Qualtrics survey questions answered at Pegasus before students started the project.

3. Project Reflections

Students (n=12) in *Landscape Planting Practice* in 2024 undertook a planting design project that aimed to develop knowledge and understanding of the successful preparation and implementation of planting proposals on a vacant public open space in the heart of the commercial precinct of Pegasus town centre. In the project brief for the course, students were asked to complete a series of practical design tasks that were compiled into one pdf document for grading. As part of this project, one of the tasks was to reflect on: *What they learnt from the Peek app? How would they have determined the site conditions without the Peek app exercise? Would they recommend Peek app for other site visits?*

Each student was asked to provide a paragraph or more detailing their personal views on using the app at Pegasus in their own words. It was important to identify their reactions to using the Peek™

app after they had completed their project work. Six students provided their consent for their reflections to be shared in research publications.

RESULTS

1. Peek™ Questions and Answers

Starting at the carpark, 94% of respondents (n=11) correctly identified the lake as a human-constructed lake (Q2) and 82% were able to estimate the maximum number of cars as between 61 and 90 cars, with potentially 160 – 240 visitors at any one time (Q1) (Figure 4). Most respondents (81%) were able to identify that the water for the lake came from underground aquifers and stormwater runoff (Q6) and that the western ridge was a human-made landform (Q13). However, only 44% of respondents correctly identified the wetland as a natural landform in this coastal context (Q15). Answers were less successful with questions related to environmental conditions for plants on the site, such as plant adaptations to seasonal weather conditions (high or low rainfall) (Q14, 44% correct), plant tolerance of salt-laden winds, air pollution and low soil moisture (Q11, 50%), dry plant conditions with water infiltrating into sandy soil (Q8, 75%) and natural disaster (tsunami) risks for Pegasus town (Q5, 71% correct). These answers had to be deduced from the respondents' knowledge of the broader environmental context that was near the coast, exposed to strong easterly winds and underlain by sandy soils. Two measurement estimations were made of the number of plant species around the bridge (Q9, 50% correct) and the total area of open grassland (the site for the students' planting proposals in their project) (Q10, 75% correct). Open-ended questions (Q4 and Q16) showed good general knowledge of coastal wetlands (observable) and plants suited to these environments but only two respondents suggested that Pegasus was once an old sand dune system that protected the site from storm damage.

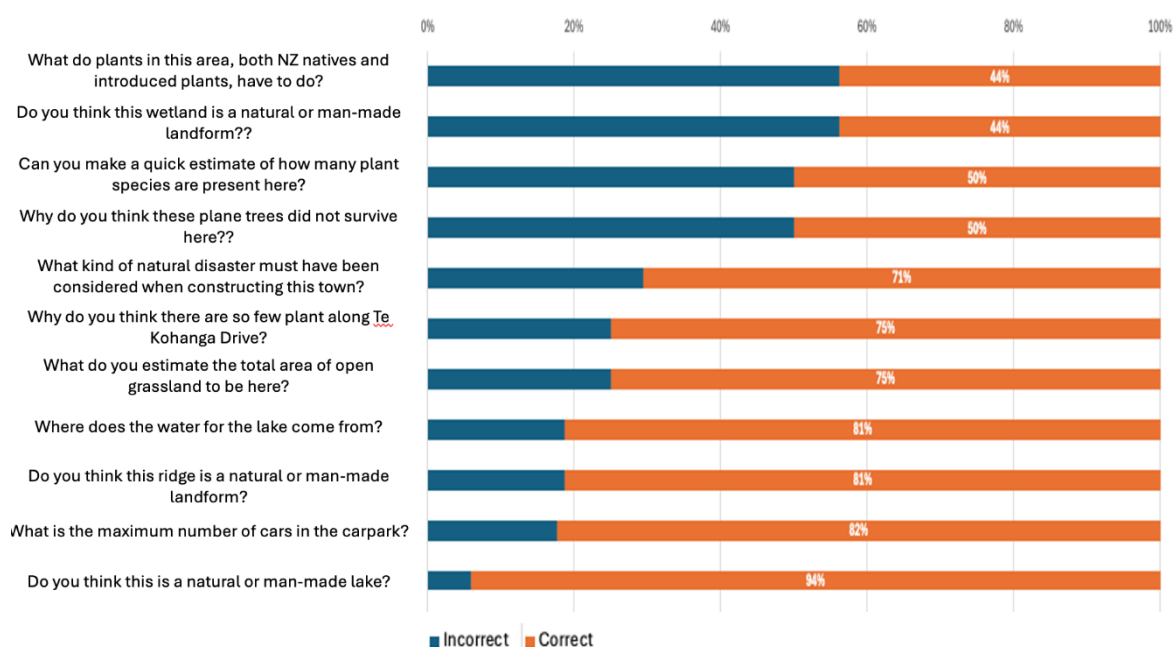


Figure 4: Percentage of correct and incorrect answers from students (n=11) to 11 multiple choice questions on the Peek™ app during the field excursion at Pegasus in August 2024.

2. Qualtrics Survey

Of the 10 student respondents at Pegasus with the teacher, strong agreement was gained for the

following statements (Figure 5):

- Using the Peek app is a good way to learn about this location (7 students strongly agreed, 2 agreed, 1 student was neutral)
- I learned to use the Peek app quickly (6 students strongly agreed, 3 agreed, 1 student strongly disagreed),
- I would like to have more site visits using the Peek app (5 students strongly agreed, 4 agreed, 1 student strongly disagreed)
- Using the Peek app will make it easier to remember information about this location (4 students strongly agreed, 3 agreed, 2 were neutral/unsure, 1 student disagreed)

Students also agreed that:

- Site visits are an enjoyable way to learn (5 students agreed, 4 strongly agreed, 1 student was neutral)
- Site visits help my understanding of the related assessment (6 students agreed, 3 strongly agreed, 1 student disagreed)

Please rate your level of agreement with each of the following statements about the the use of the Peek app for your site visit:

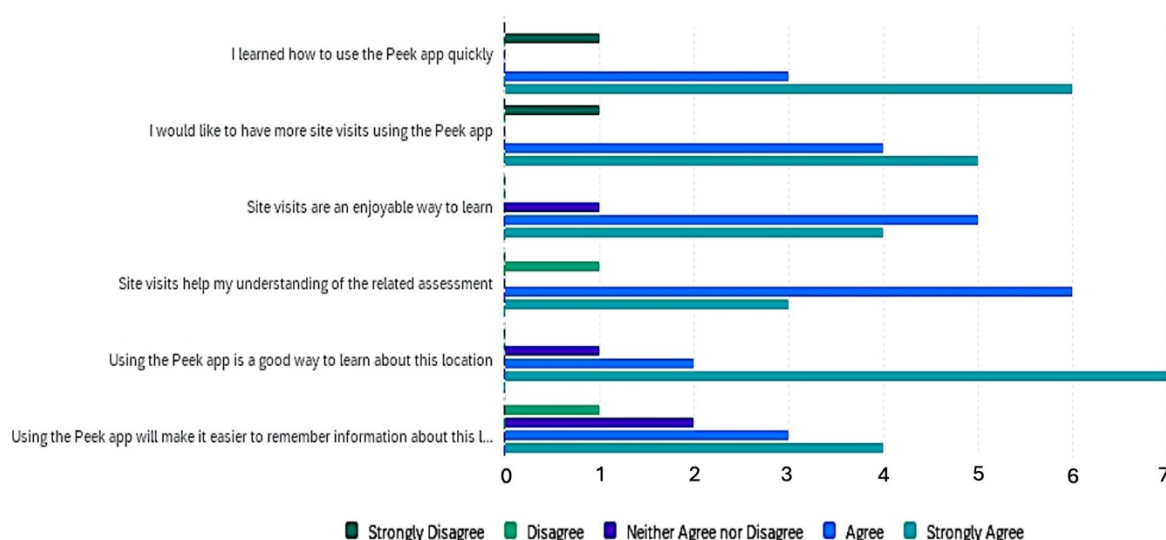


Figure 5: Students (n=10) level of agreement about the use of the Peek™ app.

When asked to rank the options for using/not using the Peek app, with/without a teacher, and with/without other students, student respondents (n=10) noted the following preferences in order of priority (Figure 6):

1. explore a site with other students with the Peek app (as was done at Pegasus)
2. explore a site on my own with the Peek app
3. explore a site with other students without the Peek app
4. explore a site with other students and teaching staff with the Peek app
5. explore a site with other students and teaching staff without the Peek app
6. explore a site on my own without the Peek app

This suggested that field excursions were enjoyable because they were with other students and the Peek app facilitated this social interaction. However, the Peek app was also considered to be useful

if you had to visit a site on your own. If teaching staff were present, the Peek app was better to have than not to have. Exploring a site on your own without Peek or anyone else to assist was the least preferred option.

Please rank your preference (drag and drop) for site visits from the following options:

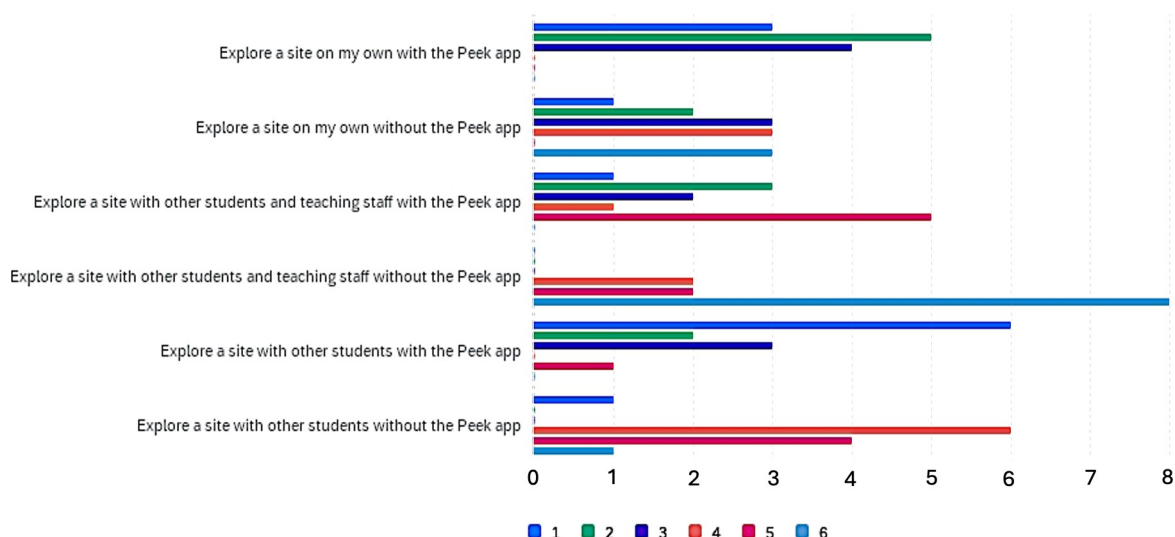


Figure 6: Ranking of site visit options using/not using the Peek app, with/without a teacher, with/without other students (n=11)

3. Project Reflections

While the initial reactions to using the Peek app were very positive on the day, it was important to compare the students' reflections on using the Peek app ten weeks later, after they completed their projects. Five major themes were revealed in their comments:

i. Focused Site Information

As mentioned above, landscapes are highly dynamic and complex environments that our students need to learn how to decode with respect to the specific knowledge needed for planting design projects. Learners can feel overwhelmed and confused in shifting from a lay person's perspective of a place to a professional perspective that informs their design work. The Peek app demonstrated to students how they should focus their attention, as student S3 explains:

During most site visits, I often feel overwhelmed by the sheer amount of information. Writing everything down can be time-consuming, and it's hard to know if you're capturing what's truly important. The Peek app provided guidance with this. Tailored questions really help focus your thoughts, encouraging you to consider the key aspects of Pegasus. ~S6

Unlike other design disciplines, landscape architects must have an integrated knowledge of geological formations, natural processes particularly in relation to wind and water, vegetation patterns and socio- cultural values. Thus, the Peek app allowed the teacher to clearly point out and succinctly explain to students some of these intangible elements of the broader landscape with focused questions at key locations. This was intended to create authentic, relevant and memorable experiences for each student individually so they could draw on these experiences at another site in

the future, as suggested by this student:

Being asked important questions helps us grasp key aspects of a site. As we progress, these questions become ingrained, allowing us to ask them independently without relying on the app. ~S6

The Peek app allowed the teacher to communicate important knowledge by capitalising on how students perceived the site through way finding and an exploration of plantings from the coastal wetland to ridgeline to freshwater wetland across the site, as explained by these students:

The [Peek] app helped me understand the site's natural conditions better, like which plants dominated, where trees struggled to grow, and how winds affected vegetation—details that would be hard to find without being there. ~S1

Determining site information would have otherwise been less successful and I am not sure how we would have determined site conditions without it. ~S4

ii. Learning at Own Pace

Time pressures for both teachers and students in meeting deadlines add considerable stress to learning and teaching in universities. Allowing students to learn at their own pace, or in their own time, was clearly important to them in facilitating site-centric learning and thinking for all students. The Peek app allowed the site visit to be undertaken with less time pressure as it was not assessed or guided by the teacher in person, adding to the students' sense of enjoyment and efficient use of their time during a field excursion, as these students explain:

This feature [in Peek] allowed me to engage with the field trip at my own pace, making it easier to absorb information and reflect on my surroundings in real time. ~S2

I also appreciated the independence the [Peek] app provided; its easy-to-use interface let me spend extra time on areas of interest, gather ideas, take notes, and brainstorm initial concepts. ~S1

I found that I retained information more effectively and efficiently as using the Peek app allowed me to interact with the site at my own pace whilst still being within a group setting. ~S4

iii. Not Just Listening

Interestingly, there was more reciprocity built into the Peek app than with the conventional approach of a group just listening to a teacher acting as guide around the site. Questions and answers, although on mobile phones, were far more interactive for each student than in a group. Each student simultaneously engaged with the physical environment, answered focused questions and reflected on their answers, whether correct or not, based on feedback from the teacher, as explained by these students:

The Peek app was a fun way of learning and a different way of gaining knowledge about the site in contrast to listening to a council or community representative. ~S4

This interactive approach significantly boosted my engagement compared to traditional field trips, where a single guide speaks to the group. In those scenarios, it can be hard to hear everything, and for me, simply listening is not a very engaging way to learn. ~S2

However, not all students favoured this approach, as one student felt that:

When a person acts as guide there is far more engagement and interaction with the surroundings – the landscape – and within the group itself. A guide often initiates discussions and can answer any questions students may have on the spot. The advantages can be even greater if the group is small as there is more opportunity for the sharing of observations and ideas. It makes for a much more memorable experience whereas the ticking of boxes on an app less so. ~S5

iv. Relevance to Project Work

The key locations were chosen by the teacher based on background information provided by a professional landscape architect who worked on the site during its design and construction stages. The Peek app became a means for the teacher to bridge the gap between professional knowledge of a site and the students' project work. Some students found the contextual information helpful and relevant in informing their own work, as these students found:

The interactive nature of the app allowed me to retain a lot of information from the field trip, which was invaluable for the subsequent stages of our landscape architectural project. ~S2

[Knowledge of the] broader context offered a more holistic view of the environment before focusing on our 1:100 site, sparking ideas for my design vision and rationale early on. ~S1

Peek app helped me with choosing the site and with understanding the whole concept of the town, the lake and the wetland. ~S3

v. More Social Interaction

Many of the students found that the Peek app facilitated group discussions as they walked around the site in twos and threes, reinforcing multiple perspectives on site features that individually they may have missed, as this student suggested:

The prompts from the quiz allowed us as a group to have in-depth conversations about areas of the site we wouldn't have otherwise discussed due to our limited knowledge of Pegasus. ~S4

However, one student had a different viewpoint based on her expectations of how a site visit should be conducted:

Having an app "taking over the function of guide" made for a very one-dimensional fieldtrip, a passive experience. Framing an excursion through multiple-choice questions is a simple way of measuring learning, but I'm not sure how much knowledge or understanding of a subject is actually acquired. ~S5

You negotiate physical space very differently with a screen as a guide rather than a person. Your focus, more often than not, is divided/decreased when phones are present even if they aren't ringing. There is the added distraction of incoming texts, Instagram feeds, emails... ~S5

DISCUSSION

Student learning on field excursions has multiple benefits but also a number of challenges, including

the complex nature and amount of site information for learners, the potential extra costs for students and/or institutions, the time needed for teachers to plan, create and test useability of resources for these excursions and the inflexibility of scheduled excursions that are difficult to repeat if anyone cannot attend. This study investigated the theoretical and practical effectiveness of a mobile software application, Peek™, for student learning and teaching pedagogy in a university course focused on a *Landscape Planting Practice* project in a town centre north of Christchurch.

Theoretical Framework for Site-centric Learning

Our study began with how students theoretically may be developing their experiential knowledge on site using a mobile software application to holistically conceptualise a place in the physical world. It created an opportunity for a teacher to reflect on how asynchronous communication can theoretically help students to build their knowledge through discovery and immersion in a physical site.

Based on constructivist theories, it seems that a mobile software application does facilitate the active involvement of each individual student by scaffolding their observation, reflection and response to a situated problem, more than conventional guided-tour approaches to field excursions. Our findings support those of Andalib and Monsur (2024), Stalheim and Somby (2024) and Li and Liu (2022), suggesting that students, in this context, were able to focus their own observations and prior knowledge of constructed wetlands, lakes and ridges to interpret the specific landforms at Pegasus. Where correct answers were given, their prior knowledge was confirmed. Where incorrect answers were given, new knowledge was integrated with their prior knowledge. Estimations of carpark size and capacity, and open space area, also focused students' attention on quantitative dimensions of the site, drawing on their prior knowledge of sports fields and car parking as ways of measuring relevant parameters for site design. As one student commented:

Tailored questions really help focus your thoughts, encouraging you to consider the key aspects of Pegasus ~S6.

This likely reduced the cognitive burden of complex and confusing information for students (Huang et al., 2016), as this student explained:

During most site visits, I often feel overwhelmed by the sheer amount of information ~S6,

thereby helping them to learn and remember more effectively. Huang et al. (2016) found a similar result in their study using a customised location-based AR application with middle school children in a botanical garden in Taiwan. They found that establishing a virtual environment for personalised exploration empowered students to learn on their own, giving them a greater sense of competency, just as one of our students explained:

This feature [in Peek] allowed me to engage with the field trip at my own pace, making it easier to absorb information and reflect on my surroundings in real time ~S2.

The conventional guided-tour approach to field excursions often leaves students dependent on the guide's knowledge and being able to hear, prioritise and digest a large amount of information. It can easily become a 'sight-seeing' exercise of limited learning value.

Furthermore, social constructivism supports mobile software applications as another way of bringing together a student's new and prior knowledge of their own experience with that of others in a group of their own choosing. In our study, the Peek™ app allowed to students to break up into walking

groups of friends and peers where they felt safe in sharing their own questions and responses, whether correct or not, and discuss other ways of understanding a particular phenomenon that may be different to their own. As this student commented,

The prompts from the quiz allowed us as a group to have in-depth conversations about areas of the site we wouldn't have otherwise discussed due to our limited knowledge of Pegasus ~S4.

However, not all students agreed, as one student explained:

A guide often initiates discussions and can answer any questions students may have on the spot ~S5.

As Huang et al. (2016) points out, interpersonal interaction is crucial to increasing student engagement on site. This is supported by our findings that showed that young adults preferred to explore a site with their peers *and* the Peek app. Developing confidence through reciprocal and well-received sharing of their own experiences with others likely helps strengthen students' cognitive structures to integrate new knowledge and prior knowledge (Bächtold, 2013), whether with peers or a teacher.

New cognitive structures must be used numerous times by students to become stable, durable and automatic (Bächtold, 2013). Our findings suggested that mobile software applications assisted in this by providing repeated questions on similar topics as students moved around the site, thereby continually engaging students with educational concepts and the physicality of their experiences. As one student said:

As we progress, these questions become ingrained, allowing us to ask them independently without relying on the app ~S6.

The situated knowledge and expertise of the teacher is important in constructing focused questions and answers that demonstrate, explain, practise, confirm and reinforce multiple times what students need to observe and learn on site. Where this is done well, new knowledge will more likely become integrated in students understanding of the physical world and cannot be unlearned (Bächtold, 2013).

Experiential learning theories support the need for mobile software applications to provide a structured, well-organised, logical set of experiences for students to navigate unfamiliar environments. Zimmerman et al. (2023) studied learning-on-the-move related to geologic time and geoscience processes using a customised AR tool called *Time Explorers* with families at Penn State University. They suggest that narrative immersion can be learner-driven where users create their own storying of landforms and water bodies. In our study, students learnt how to identify environmental conditions for plants on the site, plant adaptations to seasonal weather conditions, plant tolerance of salt-laden winds, air pollution and low soil moisture. As this student pointed out:

The [Peek] app helped me understand the site's natural conditions better, like which plants dominated, where trees struggled to grow, and how winds affected vegetation—details that would be hard to find without being there ~S1.

In designing a pathway through the site, the teacher was able to create a logical sequence of experiences that allowed students to create their own story of landforms, water bodies and plant communities from the site.

Adding new materialist theory here would suggest that mobile software applications could help students gain access to multicultural learning opportunities beyond a dominant cultural worldview, particularly in dynamic and complex site contexts in the Asia-Pacific region where indigenous voices are needed but can be scarce or reluctant. Intercultural educational experiences should strengthen values for learners and teachers, such as respect, understanding, acceptance of diversity, sensitivity, solidarity and cooperation (Xu, 2024). This gives rise to the importance of reinforcing constructive co-existence and mutual understanding among individuals. Xu (2024) argues that outdoor learning has the potential to unify by developing learners' collaborative skills, teamwork and positive interpersonal relations. We imagine mobile software applications could potentially be a means of giving and receiving knowledge (reciprocity), exchanging traditions of cultural inheritance (inclusivity) and sharing ecological passion (sustainability) between students, even in large groups (scalable), in relational outdoor settings by inviting intercultural voices to co-create learning resources. Kaupapa Māori and the notion of Ako seems to support this view, advocating for cultural competency and cultural safety training, especially for non- Māori teachers and students in how to respectfully engage with Māori culture and contexts to help create a more inclusive set of learning experiences (Shadbolt et al., 2024). We aim to introduce Indigenous voices related to Pegasus using the Peek app in the future.

Methods in Research

This study demonstrated an approach where a teacher was able to easily incorporate methods in a course to improve her teaching practice through research with her students as voluntary participants using a newly introduced mobile software application, the Peek™ app. The selection of Pegasus township, a coastal subdivision built over a Ngāi Tūāhuriri battlefield near Kaiapoi Pā at Pegasus Bay, 30 km north of Christchurch in Aotearoa New Zealand, was intended to have both ecological and bicultural perspectives for learners. The latter has yet to be fully communicated to respectfully engage with Māori culture and tikanga (protocols) as suggested by Shadbolt et al. (2024) but remains an aspirational goal. Requesting students to complete the Peek™ questions and answers and Qualtrics survey on the day of the field excursion added minimal time commitment for students but initiated their reflective and critical thinking about their learning experiences on site, *before* they began their project work. Requesting students to add their reflections to their project work also added minimal time commitment for students but provided some very helpful user perspectives, after the initial outdoor enjoyment of the field excursion had subsided and *after* they had to use their field knowledge in their project work. While other studies (Adams et al., 2010; Andalib & Monsur, 2024; Huang et al., 2016; Stalheim & Somby, 2024) have employed interviews in their research approaches, this study aligned with Li and Liu (2022) who collected data via questionnaires on students' behavioural intentions. Our approach thus captured both quantitative survey responses and open-ended personal reflections on the learning effectiveness of the Peek™ app with minimal disruption to the learning and teaching syllabus for *Landscape Planting Practice*.

Learning Outcomes

The *Landscape Planting Practice* course aimed to develop students' knowledge and understanding of the techniques, issues and methods required for the successful preparation and implementation of planting proposals in landscape architectural professional practice. The field excursion component, as in most land-based disciplines, helped students to contextualise the issues associated with situated problems for human stakeholders and more-than-human life forms, i.e. plants involved

in this project, both practically and hypothetically.

Two of the specific learning outcomes were to (a) determine the significance of environmental site conditions to planting design implementation; and (b) compare different plant communities/assemblages in relevant project contexts. Students reported being able to identify environmental conditions for plants on the site, plant adaptations to seasonal weather conditions, plant tolerances of salt-laden winds, air pollution and low soil moisture. Hajirasouli and Banihashemi (2022) have noted that technology-based applications have a positive impact on learning through improving motivation, participation and social engagement, as we noted above, but also in increasing in-depth and long-lasting knowledge. Our study supports these conclusions, although it has yet to be confirmed whether learning outcomes in *Landscape Planting Practice* were carried on to *Innovative Practice* by the same students the following year.

CONCLUSION

This study set out to investigate how reciprocal, inclusive, scalable and sustainable the use of a mobile software application, specifically Peek™, can be for site-centric learning in landscape architecture, and how such a tool might influence student's knowledge and awareness of the landscape. This work embedded simple data collection tools into a syllabus with questions and answers during the field excursion, a feedback survey after the students used the app while on site, and then reflections after the students completed their project work.

The findings demonstrate that Peek™, a mobile application enabling asynchronous communication through digital text, images, videos, audio clips, and interactive elements, offers an effective model for supporting learning during field excursions. By providing an interpretative walking guide curated by educators, the app scaffolds students' observations, reflections and responses to situated problems in the landscape.

Students reported that the combination of multisensory experiences and peer collaboration during the field excursion, along with post-excursion engagement with the teacher, deepened their understanding of the content. They also noted that the Peek™ app encouraged them to perceive and interpret the physical environment in new ways. From the teacher's perspective, the app provided a structured, logical, and well-organised learning experience for students, particularly valuable in unfamiliar environments. Notably, it also prompted the possibility of integrating Indigenous voices into the learning journey.

A key strength of the approach of introducing a mobile software application lies in its ability to benefit students, educators, and institutions alike. By addressing common constraints associated with field excursions—such as time, accessibility, and consistency—the integration of the Peek™ app into a 200-level *Landscape Planting Practice* course enabled a more reciprocal exchange of knowledge between students and their teacher. The approach to field excursions presented in this study is seen as adaptable across different locations and disciplines, making it a versatile tool for enhancing experiential learning.

However, this study is not without its limitations. The findings are based on a small cohort within a single course, which may affect the generalisability of the results. Additionally, the study focused on a single mobile software application, Peek™, within a specific disciplinary context. These constraints

suggest the need for further investigation into how such tools perform across varied educational settings.

Building on these findings, future research could explore the use of mobile software applications in larger and more diverse student cohorts, across different disciplines, and with alternative digital tools. Such studies would help determine the broader applicability and adaptability of mobile-supported field excursions and clarify the pedagogical and logistical considerations for educators and institutions.

The potential applications of this work are wide-ranging. Beyond landscape architecture, disciplines such as environmental science, geography, urban planning and farm management could benefit from mobile-supported field excursions. Additionally, exploring alternative mobile applications could help determine whether the benefits observed are unique to Peek™ or indicative of a broader trend, suggesting wider potential for mobile-supported experiential site-centric learning.

This study contributes to the growing body of research on mobile learning by demonstrating how a thoughtfully designed digital tool can enhance student engagement, deepen understanding, and support inclusive and scalable field-based education. With further development and broader implementation, such tools have the potential to transform how students interact with and learn from the landscapes around them.

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The Transformation of AI-Driven Educational and Training Resource Development Models and Ecological Reconstruction: Practice and Outlook of the Central Agricultural Broadcasting and Television School

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ABSTRACT

Against the backdrop of the continuous advancement of global educational digitalization, the insufficient supply of high-quality educational and training resources and low development efficiency remain key issues restricting educational equity and the expansion of educational scale. Traditional resource development methods are often characterized by long cycles, high investment, delayed updates, and lack of targeting, making it difficult to adapt to the increasingly diverse and dynamically changing learning needs. With the rapid development of AI technology, especially Generative Artificial Intelligence, the field of educational resource development is undergoing a profound transformation in its operational models. Based on a combination of theoretical review and empirical analysis, this paper systematically elaborates on the innovative impact of AI technology on the full-process development of educational video resources. It focuses on verifying the application value of AI by taking the “AI + Short Video Practical Training Camp” series organized by the Central Agricultural Broadcasting and Television School as a case study, and looks forward to the future development paths and challenges. This study aims to provide a reference case for the research and development of distance education worldwide.

Keywords

AI; Educational and Training; Video Resources; Digital Humans; Digital Empowerment; Rural Distance Education

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INTRODUCTION

Educational and teaching resources are core elements for implementing effective teaching and ensuring educational quality. However, for a long time, resource development has generally faced many practical challenges: it is highly dependent on the personal experience of experts and teachers, resulting in long development cycles; the process—from needs analysis, syllabus formulation, content writing to multimedia production and review—is complex, consuming substantial human and time costs; the update of finished resources is slow, making it difficult to keep up with the pace of knowledge iteration; and the forms of resources are relatively uniform, failing to accurately meet the personalized and differentiated learning needs of learners. The rapid advancement of AI technology, particularly breakthroughs in natural language processing, computer vision, and generative AI, has provided new possibilities to address the aforementioned challenges. AI is no longer merely an auxiliary tool, but is gradually becoming a “collaborative innovation partner” and “efficiency enhancement engine” in resource development, driving the transformation of resource construction from the traditional “human-led” model to a new intelligent and large-scale stage featuring “human-machine collaboration”.

1. OVERVIEW OF THE CENTRAL AGRICULTURAL BROADCASTING AND TELEVISION SCHOOL SYSTEM

The Central Agricultural Broadcasting and Television School (CABTS) is a national-level distance education and training system for farmers, jointly supported by multiple ministries and commissions including the Ministry of Agriculture and Rural Affairs and the Ministry of Education. Since its establishment in 1980, CABTS has always adhered to the mission of serving “agriculture, rural areas, and farmers”, and has built a five-tier education management network covering the central, provincial, municipal, county levels, and more than 16,000 farmer field schools, forming an education and training system that connects urban and rural areas.

A core advantage of CABTS lies in its continuous innovation in educational methods. Starting from the early use of radio, television, and audio-visual materials for teaching, to the establishment of the China Rural Distance Education Network in 1999, and the independent development of the “Yunshang Zhinong” (Smart Agriculture on Cloud) APP in 2016, CABTS has continuously integrated traditional media and new media resources. It has formed an omni-media teaching matrix centered on publications such as Farmer Science and Technology Education (magazine) and Agricultural Broadcasting and Television Education (newspaper), TV programs like Pastoral Help Group, radio programs such as Talking Agriculture and Sharing Experience, the China Rural Education Website, the “Nongguang Xintiandi” (CABTS New Horizon) new media matrix, and the “Yunshang Zhinong” APP. In recent years, the school has also actively collaborated with platforms such as Douyin, launching projects like “Learn Agricultural Technology on Douyin”, which has achieved a topic view count of 24.63 billion, significantly expanding the coverage and participation of agricultural technology dissemination.

Up to now, CABTS has trained over 6.1 million farmers with secondary education qualifications and provides more than 12 million person-times of training annually, becoming a key force in promoting agricultural modernization and rural revitalization. Its distance education model, characterized by omni-media coverage, wide reach, and low cost, provides an effective approach for large-scale cultivation of rural practical talents. Moreover, it reflects CABTS’ school-running philosophy of always

centering on farmers' learning needs and focusing on improving training effectiveness. By continuously innovating distance education methods, expanding resource dissemination channels, and optimizing the system's operation mechanism, CABTS has laid a solid foundation for large-scale, high-quality, and wide-ranging farmer education and training, and has also provided a valuable Chinese model for global rural distance education.

2. CRITICAL LINKS OF AI EMPOWERING TEACHING RESOURCE DEVELOPMENT

In recent years, AI technology has brought systematic transformations to the development of teaching resources, and CABTS has been committed to researching the application of AI to enrich and improve teaching resources and methods. Through research, it has been found that AI technology demonstrates significant advantages in the production of teaching resources, especially in the field of video resources. Its application covers the entire process from content generation to resource management, mainly reflected in the following aspects:

Firstly, in the content creation link, AI can automatically generate teaching handouts, video scripts, and test questions, greatly improving the development efficiency of text-based resources. Intelligent tools can quickly organize knowledge systems, generate course syllabi and teaching frameworks, and provide effective support for video design. At the same time, AI can also realize multilingual translation and colloquial conversion, lowering the threshold for content creation.

Secondly, in video production, AI technology significantly reduces the difficulty and cost of developing high-quality video resources. Through speech synthesis and digital human technology, video lectures by virtual teachers can be generated just by inputting text manuscripts, supporting multilingual and multi-dialect output— this is particularly suitable for the popularization of large-scale standardized knowledge. Intelligent editing tools can automatically identify redundant segments, generate accurate subtitles with one click, and realize multilingual translation, greatly improving post-production efficiency.

Thirdly, in the resource management link, AI helps maintain the timeliness and adaptability of resources. The system can automatically track the latest developments in the field, mark outdated content and prompt updates, assisting developers in maintaining the accuracy of resource libraries. By analyzing user viewing data, AI can also provide a basis for optimizing the content and form of videos, supporting the continuous improvement of resources.

AI is driving the transformation of teaching resource development from the traditional model to a human-machine collaborative intelligent model, providing new possibilities for the large-scale production and personalized adaptation of educational resources.

3. PRACTICAL CASE: CABTS' "AI + SHORT VIDEO PRACTICAL TRAINING CAMP"

To verify the feasibility and effectiveness of AI empowering video resource development in practical applications, CABTS held two sessions of the "AI + Short Video Practical Training Camp" in Baoji (Shanxi Province) and Beijing in 2025.

3.1 Case Overview

The core goal of both training camps was to improve the new media operation capabilities of practitioners in the “agriculture, rural areas, and farmers” field, with a focus on introducing AI tools to assist in the creation of agricultural short videos and live broadcast promotion. The training adopted an immersive learning approach combining “theoretical teaching + group practical operation + work creation”, covering core content such as AI-assisted topic selection, script generation, intelligent editing, digital human application, and live broadcast content generation. The participants included 65 people in the Baoji session and 43 people in the Beijing session, ranging in age from 20 to 64 years old. Under the guidance of expert lecturers, they fully participated in the entire process from learning and practice to work output, and successfully created short videos that met the standards.

3.2 Application and Effects of AI Video Development Technology

Intelligent Script Generation: Using intelligent tools, participants quickly generated short video scripts and promotional copy in multiple styles and versions based on the characteristics of their main agricultural products (such as apples, kiwifruits, and camel milk). This enabled rapid content trial and iteration, significantly improving the efficiency of idea initiation and copy preparation, and laying a foundation for subsequent video shooting.

Digital Human Video Production: The training camps focused on introducing practical courses on “AI Digital Humans”. Participants could generate virtual human broadcast videos just by inputting text. This technology greatly reduced the threshold and time cost of producing high-quality spoken video content, providing a feasible path for the future production of large-scale, multi-dialect agricultural technology promotion videos, and serving as a typical example of AI replacing traditional manual work.

Intelligent Editing and Material Generation: Participants widely used intelligent tools for initial video editing, automatic subtitle generation, and translation. Lecturers used AI tools to disassemble excellent cases and taught narrative and camera application skills through “video analysis” (frame-by-frame analysis). AI also assisted in generating some animated materials that were difficult to shoot in real life, significantly reducing operation difficulty and improving the efficiency and professional quality of work output. The Beijing session further strengthened practical skills such as one-click video generation and the use of intelligent templates.

Personalized Content Adaptation and Live Broadcast Promotion: Participants learned to use AI to derive multiple short video versions of the same product introduction content, adapting to different platforms (such as Douyin and WeChat Channels) and different audiences. In addition, the courses enhanced the application of AI in live broadcasts— for example, using intelligent tools to generate live broadcast script frameworks, analyze live broadcast room data, and formulate promotion strategies, reflecting the comprehensive empowerment of AI from “recorded broadcast” to “live broadcast” scenarios.

3.3 Practical Insights and Challenges

The successful holding of the two training camps fully verified the potential of AI in improving video resource development efficiency, reducing production costs, and stimulating content innovation. The training camps explored and practiced a new human-machine collaboration model: domain experts (lecturers) are responsible for guiding the direction, providing core knowledge, and ensuring content accuracy, serving as “leaders of creativity”; AI tools undertake large-scale, standardized content

generation and multi-form output, acting as “implementers of efficient production”; participants and resource developers transform into “managers of intelligent tools” and “optimizers of resources”, focusing on strategy formulation, instruction optimization, and effect regulation. This collaboration mechanism greatly releases human resources and achieves a significant improvement in the efficiency of educational resource development.

4. SUMMARY AND OUTLOOK

AI technology is comprehensively changing the development methods of educational and teaching resources, and its application in the field of video resources is particularly prominent. Both theoretical analysis and practical cases show that AI has revolutionary potential in content generation, form innovation, efficiency improvement, and personalized adaptation. The practice of CABTS’ two training camps demonstrates that this technology has achieved tangible results in specific fields such as agricultural education and training, and can support a wider range of content creators to participate in the construction of high-quality resources.

As China’s largest rural distance education institution, CABTS has always adhered to a farmer-centered approach and technology-driven development, continuously promoting the innovation of distance education methods and resource construction models. Looking forward, CABTS will further conform to the trend of digitalization and intellectualization, focus on building an intelligent online learning platform, improve the comprehensive service system, enhance the level of multi-media integration application, and continuously promote farmer education and training towards higher quality, higher efficiency, and wider coverage.

Currently, CABTS is actively advancing the smart campus infrastructure development project. Relying on technologies such as the Internet of Things (IoT), mobile Internet, and artificial intelligence, it is conducting a comprehensive digital upgrade of teaching, management, service, and other businesses as well as the campus environment. By building functional modules such as smart teaching, smart services, smart buildings, smart energy conservation, and smart computer rooms, it realizes the intelligent scheduling of teaching resources, refined management of energy consumption, and personalized support for the learning process, providing farmers with a more efficient, convenient, and green learning environment. The smart campus will not only improve the efficiency of on-campus teaching and management, but also realize the optimal allocation of resources through data-driven approaches, further reducing operating costs and expanding the coverage and response speed of educational services.

At the same time, the XR virtual simulation teaching pilot will become an important direction for the innovation of farmer education and training models. CABTS plans to take the lead in building a “Virtual Teaching Experience Center for Farmer Education and Training”, focusing on introducing virtual simulation and augmented reality technologies in high-cost, high-risk, and high-difficulty practical teaching links such as homestay operation, agricultural non-point source pollution control, pest and disease control, and pathological anatomy. By constructing an immersive and interactive virtual learning environment, participants can conduct independent operations and repeated practice in simulated scenarios, greatly improving learning effects and safety, and making up for the shortcomings of physical practical teaching. This pilot will not only help solve problems such as the lack of experimental resources and insufficient teaching staff in rural areas, but also promote a profound

transformation in the concept and methods of practical teaching, providing farmers with more practical and flexible learning experiences.

It should be noted that the full utilization of technological effects must rely on an open, collaborative, and shared ecosystem. The advancement of smart campuses and XR virtual simulation teaching will further strengthen the new education ecosystem featuring human-machine collaboration and the integration of virtual and real environments. CABTS looks forward to working with ICDE members worldwide and other relevant institutions to jointly explore new paths for the educational application of AI, address common challenges such as data ethics and the digital divide, and collaborate to promote the co-construction and sharing of educational resources. It is expected that technological progress will truly benefit every learner, contributing Chinese wisdom and strength to building a learning society where everyone can learn, everywhere can learn, and learning can happen at any time.

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A Rose by Any Other Name: AI Augmented HyFlex Learning

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ABSTRACT

University of Southern Queensland addressing the evolving landscape of higher education and the need for innovative, open educational practices. Between October 2024 and July 2025, UniSQ was the sole non-European participant in the JISC Beyond Blended pilot program. In conjunction with the JISC pilot, UniSQ implemented an internal HyFlex-Beyond Blended pilot that fostered interdisciplinary collaboration to design blended learning experiences. The study examines how HyFlex learning is approached in the context of a university that is largely online and how AI tools improved student choice, accessibility, and inclusivity thereby expanding educational opportunities. The paper highlights AI's potential to personalize learning paths, automate content creation and provide intelligent tutoring systems. These capabilities enhance both academic efficiency and learning design. AI-driven chatbots, for instance, can emulate peer interactions and support asynchronous student dialogue, fostering a sense of community among diverse learners. The strategic integration of AI also enhances interaction in both synchronous and asynchronous learning environments, recognizing the critical roles these modes play within HyFlex and blended approaches. Findings suggest that strategic AI implementation enhances flexibility, accessibility, and personalization within HyFlex frameworks, promoting inclusivity, scalability, and sustainability. Concluding discussions share implications of these findings for educators and institutions seeking to leverage AI to create more dynamic and student-centered learning environments. Key considerations include ethical AI use, AI literacy, the development of AI pedagogy, and the creation, reuse, and sharing of resources to improve collaboration, cost-effectiveness, and quality.

Keywords

innovation; HyFlex, Artificial Intelligence; learning design; synchronous; asynchronous; hybrid; blended; chatbot; chat agent

Sustainable Development Goals (SDGs)

This study is linked to Quality education (SDG 4).

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