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30th International Council for Open and Distance Education World Conference 2025

A Future Beyond Mass Education: Higher Education as an Integrity Institution

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ABSTRACT

Systems of higher education are globally facing the challenge of remaining relevant to their societies and to the needs of people throughout their lives. Defining higher education purely as a means to obtain qualifications in the most efficient manner is driving a degradation of the system even as numbers of students grow. As the scale of provision and participation has grown from its elite roots, issues of context, including cost and affordability, and quality, including relevance and impact, mean that economic and political interests are challenging the way educational systems operate. Many once-celebrated systems now face declining public investment, rising costs, societal criticism, regulatory interference, and threats to academic freedom. These trends risk diminishing higher education's intellectual leadership and public good contributions, reducing it to a purely utilitarian function.

How can higher education move beyond a mass system defined by economic efficiency and direct employment outcomes? What model respects public funding, and provides sustainability, institutional confidence, and clarity for future leadership? This paper proposes that higher education systems serve a vital role as institutions sustaining the intellectual integrity of societies. This integrity function provides a clear role for higher education through the critic and conscience function of scholars, as well as through ongoing education and research providing communities and individuals with the tools needed to maintain the integrity of information used for commerce and politics. Implications for how higher education operates within educational organisations as well as the wider regulatory and political space will be explored.

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How Universal Design for Learning Enhances Distance Postgraduate Learning In Aotearoa New Zealand

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ABSTRACT

Originating in the world of design and architecture, Universal Design has been adapted and applied in compulsory and tertiary educational environments to ensure accessible learning opportunities for all (Meyer et al., 2014), showing an increase in student satisfaction for both disabled and non-disabled learners (Cumming & Rose, 2022). In this paper, we share findings from our recent research study which sought to explore how the Universal Design for Learning (UDL) framework can support us to improve our teaching and learning practices as facilitators of postgraduate work-based programmes, delivered via distance in Aotearoa New Zealand. Our study utilised a qualitative and emergent research approach, and a practice focused Insider and Action based research methodology, with researchers as participants. Data were gathered from a series of online meetings and between-meeting reflections, then thematically analysed. Findings showed how the UDL framework was utilised as a critical reflection tool in our day-to-day work and enabled us to enact our commitment to Te Tiriti o Waitangi principles, as tangata Te Tiriti (people of the Treaty of Waitangi, non-Māori). We also explored the value of UDL in sustaining positive change through collaborative practices in our volatile vocational and tertiary teaching and learning environment. Finally, we discuss the implications of our findings when considering the applicability of UDL in the tertiary space in Aotearoa New Zealand (and globally), and the provision of distance online learning in the vocational education space, acknowledging the challenges and opportunities associated with this.

Keywords

accessibility; distance education, inclusive practices; insider research; learner agency; learning design; postgraduate learning; thematic analysis; universal design for learning; work-based learning

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INTRODUCTION

Universal design was conceived in the 1950s to determine and evaluate the utility of products and environments "by all people, to the greatest extent possible, without the need for adaption" (Connell et al, 2008, p. 97; Lomellini et al, 2025). Decades later as part of the disability movement, Universal Design was variously adapted for use in schools as Universal Design for Instruction (UDI), Universal Instructional Design (UID), and Universal Design for Learning (UDL). The main goal of UDI was to create accommodations within learning environments, while UID followed seven architectural and two additional principles (community building and engagement) (Lomellini et al, 2025). Combining features of both UDI and UID, the aim of UDL is to design for learning that encourages learner agency by offering accessibility, choice, and challenge for every learner. Ongoing development of UDL has been led by the Centre for Applied Special Technology (CAST) who promote the framework on their website (CAST, 2025). UDL is built on three broad principles, Engagement, Representation, and Action and Expression, with evidence-based guidelines for effective learning design detailed under each principle. Aligned with the three main principles are a total of thirty-one guidelines, formerly called "checkpoints" in UDL version 2.2, and now "considerations" in version 3.0. While research has established the basis of these UDL guidelines (e.g., Dolan et al., 2005, Ely et al., 2006, Xiaowen et al, 2006; CAST, 2018), evidence on the application of UDL in the tertiary education setting is limited.

CONTEXT / BACKGROUND

In Aotearoa New Zealand, our higher education system comprises institutes of technology and polytechnics (ITPs), wānanga, universities, private training establishments (PTEs), and industry training organizations (ITOs) (Brownie et al., 2004). Te Tiriti o Waitangi | the Treaty of Waitangi (1864) and its derived principles serve as a guiding legislative and philosophical framework for tertiary educators. The (2020-2022) National Education and Learning Priorities (NELPs) informed the Tertiary Education Strategy (TES) (2009, 2022) which provides a comprehensive outline of key priorities, objectives, and expected actions for those working in the sector. The identification of inadequate provision (2020-2022) for priority learners enrolled in ITPs, namely Māori, Pacific, and Disabled ākonga influenced the decision to establish a single vocational education network, Te Pūkenga (NZQA, 2025; Tuohy, 2022). The subsequent announcement of Te Pūkenga's disestablishment in December 2023, represents the sector's volatility (Te Pūkenga, 2025).

As three vocational tertiary educators delivering postgraduate work-based learning (WBL) programmes by distance, we saw the possibilities of applying UDL in our learning and teaching environments to promote ākonga access and participation. The team had previously, individually used the UDL framework in learning design and development, enhancing inclusive, culturally responsive, and reflective practices, and in the co-construction of learner pathways. Our hunch was that UDL had a much wider utility, and we wanted to explore this more fully. We believed a deeply reflective research process could result in positive changes in our own learning and teaching practices. That is, by reflectively evaluating our own practices while using UDL to design learning for all, we might build experiential understanding of the applicability of UDL with others.

Facilitating Postgraduate Work-Based Learning by Distance

The researcher-participants' work is situated in the postgraduate learning environment across several programmes, including the Postgraduate Certificate in Learning Design (PGCLD) (Level 8), and the

Master of Professional Practice (MProfPrac) (Level 9). In both courses, learners are situated as the expert, with the MProfPrac supporting the development of research skills including ethical decision-making; and the PGCLD, critical application of new knowledge, with a focus on learning design. Both programmes include a work-based project in which learners use their workplace as an authentic setting for their project, to capture and extend their existing knowledge and skills, through experiential and reflective learning. WBL is internationally considered to broaden participation in higher education (Nottingham, 2016) and has the flexibility to meet the objectives of both the individual and work organisation.

Learners enrolled in postgraduate studies are geographically dispersed and enroll in their respective programmes with diverse professional and personal backgrounds. Motivations to study vary, with some learners deciding to study because of external factors requiring upskilling, and others embarking on a self-motivated challenge. Learners study either full-time or part-time or a mix of both across their programme, around multiple other commitments. Some learners studying the MProfPrac have emerged from a non-traditional non-didactic undergraduate learning pathway also offered by Capable New Zealand.

The learning ecosystem of postgraduate distance learners includes community-based work and personal supports, as well as those in the virtual learning environment. Other than integrated pastoral care, specific supports include access to Student Support services, with learning advisors' expert in accessibility and assistive technologies, and other essential services such as IT support, and free online access to Library resources.

Currently in its third year of delivery, the PGCLD is delivered online with self-directed Moodle courseware. The PGCLD was designed to encourage critical thinking skills and learners participate in both asynchronous and synchronous learning by working through activities, participating in forums, and completing milestones which contribute towards overall assessment. Synchronous tutorials /"hui" occur every two to four weeks throughout the year. Formative feedback is provided on milestones to ensure learners development of critical analysis skills and application in their work. The year-long programme consists of four 15-credit courses. Each course has two summative assessments that take place at intervals throughout the year, with re-submission opportunities available for those who do not pass. The PGCLD is delivered by Te Ama Ako Learning and Teaching development team, who also provide learning design support and capability building for the wider polytechnic.

The MProfPrac was designed by Capable New Zealand to create opportunities for learners to develop their own research inquiry project carried out in their work context. The course consists of three non-taught courses: the Review of Learning (15 credits, Level 8); an Advanced Practitioner Inquiry (45 credits Level 8); and, finally, the Advanced Negotiated Work-Based Learning Project (120 credits, Level 9). The self-directed learner identifies their own learning goals and designs and conducts an inquiry aided by a facilitated mentorship. This work-based learning model shares similarities with that of UK's Middlesex University (Nottingham, 2016); however, adaptations have been made to ensure applicability in Aotearoa's socio-cultural and Te Tiriti context (Carpenter & Ker, 2021). With a distance delivery model, the MProfPrac is facilitated through a blend of asynchronous online Moodle content, emails, Microsoft Teams communications, and regular synchronous face-to-face or online meetings between facilitators (kaiako) and ākonga (learners).

Research Purpose

The purpose of our research was to investigate how Universal Design for Learning (UDL) could enhance distance postgraduate work-based learning (WBL) in Aotearoa New Zealand. Our aim was to gain insights about our own learning and utilisation of the UDL framework, to better understand and improve our teaching and learning practices. Using a qualitative action research approach, we sought to answer:

- how the UDL framework enabled our commitment to uphold the principles of Te Tiriti of Waitangi in our learning and teaching environments,
- how the UDL framework can be utilised as a reflective tool to enhance our teaching of ALL postgraduate learners studying by distance in WBL programmes, but particularly Māori, Pacific, and Disabled ākonga; and,
- how valuable the UDL framework is in our day-to-day work supporting ākonga engagement, participation, and agency.

Contribution of this Paper

Carrying out this study informed the team's own learning, design, and teaching practices as tertiary educators, with the aim to realise UDL's goal to encourage and empower "expert learners who are…purposeful and motivated…resourceful and knowledgeable...[and] strategic and goal directed" (CAST, 2018). The study contributes insights that may be of interest to tertiary educators, learning designers, researchers, and policy makers. Specifically, it could inform practice development of tertiary educators and practical understandings for policymakers, by representing resonant findings that reach and inspire change (Tracy, 2010).

LITERATURE

Considerable research has investigated UDL in compulsory sector education. For example, many of the evidence-based "checkpoints" (hereafter referred to as guidelines) are based upon research conducted in primary and K-12 education, which has led to speculation that UDL may not translate directly to tertiary (post-secondary) settings. To date however, research in the use of UDL beyond compulsory sector education has been quite limited. Although there are a growing number of studies about the applicability of UDL in tertiary learning and teaching, Aotearoa New Zealand-based research remains scarce.

Purpose of UDL

In 2002, Rose and Meyer (2002) described how each of the three UDL principles aligned with areas of the brain involved in representation (visual and auditory cortices), action and expression (frontal lobes of the cerebral cortex) and engagement (midbrain structures associated with the affective aspects of learning). The framework principles can be applied at three different levels of learner-content interactions (CAST, 2025). Firstly, to ease learner access to information, secondly to build upon or support this, and thirdly, to internalise the new knowledge by way of executive function. In this way, the prevailing principles of the framework have not changed over time, though there has been a move toward constructivist and sociocultural underpinnings, prevalent in contemporary education, possibly in response to detractors of its neuroscientific basis.

UDL guidelines are largely based on well-established good teaching practices; for example, as Rogers and Grosneth (2021) observe, the UDL Engagement guideline to plan for community and collaboration aligns with highly effective community of inquiry approaches.

Where critics of UDL bemoan the lack of quantitative evidence for its effectiveness in supporting specific learning outcomes, Cumming and Rose (2022) reported student perspectives and found implementation of UDL had positively impacted students' abilities to engage, participate in learning, and clarify course content. UDL efficacy research suggests therefore that the framework meets its aim "to achieve increased flexibility and engagement" (Cumming and Rose, 2022, p. 1033). With multiple variables to consider in any learning environment, even grades comparison or standardised test-based measurement may not determine effectiveness uniquely attributable to application of UDL's framework and guidelines.

Application of UDL

At the outset of this project, there was a lack of UDL utilisation data in the tertiary environment and uncertainty about the translatability of an overseas-developed framework in our local Aotearoa New Zealand setting. However, application research is now emerging across education and professional settings. For example, Flanagan and Goldthwait-Fowles (2023) describe how UDL can be viewed as a starting point for designing a barrier free tertiary learning environment, rather than being an additive tool. Similarly, Sheridan and Gigliotti (2023) explored the application of UDL in the re-design of a teacher education course delivered online, to improve quality and meaningfulness. The study identified the need for collaboration between academic coordinators and the learning design team in the redesign process.

Focusing on the implementation challenges of universal design in higher and continuing education (rather than UDL in particular), Ryder and Duffy (2023) reported findings from conference dialogues involving 199 stakeholder participants in Ireland. Noted were the need for proactive rather than reactive design, digital considerations as well as those for the physical environment, and appropriate strategic directives, funding, and supports. The data also revealed a need for all to take responsibility for accessibility, but at the same time acknowledging emotional and attitudinal resistances of staff.

Available research and practice literature indicates that UDL has been applied in multiple countries. However, there is limited research available about the applicability of UDL in Aotearoa New Zealand, and even less in the tertiary sector.

Impact and Value of UDL

Recent studies in the tertiary domain suggest the application of UDL can have positive impacts for learners in terms of satisfaction, engagement, motivation, and perceptions of increased capacity in specific learning areas.

For example, Cumming and Rose (2022) found that UDL implementation resulted in increased satisfaction for both disabled and non-disabled learners in tertiary education. In a quantitative study of learning analytics data in a UDL-designed undergraduate education programme in Australia, Garrad and Nolan (2023) found UDL-informed design for learning resulted in improved engagement and reduced "attrition" of teachers in training.

Dempsey et al. (2023) surveyed a cohort of cross-disciplinary undergraduate health students, by way of questionnaire, and found self-reported motivation was increased when UDL had been applied in the

design of first year anatomy courses. Considering motivation of postgraduate international learners, Qu and Cross (2024) identified that a UDL approach aided course design and group-based learning in a virtual Master's space. However not all students shared the same understandings or motivations around learning tasks, highlighting the tensions that may exist for learners when applying UDL, between intrinsic motivation to learn and focus on assigned learning tasks and their completion.

Using an exploratory case-study approach to examine learner perceptions of UDL-based supports in an online learning course, Levicky-Townley et al (2021) investigated capacity building as perceived by learners. They found learners perceived self-regulation, comprehension, and executive functioning capacities to have increased, beliefs about attention, memory, and multitasking to have changed, and that UDL implementation reduced barriers created by distractions.

Drawing on mixed-methods data, Pittaway and Malomo (2021) reported findings from a library services and education department collaboration, where a UDL approach was used to design for accessibility to reading resources for all learners. Findings uncovered issues for both learners and staff in the process, including confidence in reading, and UDL and technology tools, respectively.

Professional Learning and Development

There is some agreeance that the UDL framework can enhance design for learning, but research has identified the need for more opportunities for educators to learn about the utility and application of UDL (Lomellini, et al., 2025; Pittaway & Malamo, 2021; Ryder & Duffy, 2023). From compulsory schooling data, we know that workforce development in UDL has the potential to change teachers' beliefs, knowledges, and practices (Lambert, et al., 2023). A key change in Lambert et al.'s 2023 study was that educators began to understand UDL as more of a dynamic way of thinking than a static tool. This was evidenced by shifts from deficit theorising and being more responsive to learners' access needs in real time.

There is emerging evidence that the application of the UDL framework can positively impact the tertiary learning environment. In Canada, to support implementation of UDL in tertiary organisations, Benton Kearney (2022) published accessible practice development literature integrating Indigenous considerations. To practice inclusive and culturally responsive practices tertiary educators and learning designers need more professional learning and development. Practice-based knowledge in UDL would mean educators could more confidently and collaboratively promote learner agency (Benton Kearney, 2022; Pittaway & Malomo, 2021; Ryder & Duffy, 2023). Evidence suggests a few hours of training changes application of the framework in practice (Lomellini et al., 2025)

METHODS

To collect data to inform insights about the alignment of UDL application with Te Tiriti commitments, and the value of the framework as a critical tool in practice, the following research methodology, methods and design were chosen.

Research Method

A practice-focused, insider, and action-based methodology was employed. As tertiary educators working in distance postgraduate learning with some prior knowledge of UDL, we held a unique position to consider, apply, reflect upon, and critique the use of UDL in our work, in an in-depth way (Costley, 2010). A practitioner perspective (pono) was taken as one of three aspects of evidence-based

learning and teaching practices in education (Macfarlane, 2011). Two types of qualitative data were collected: transcripts of participants online conversations and individual reflective data. These data were analysed thematically (Braun & Clarke, 2021).

Research Design

The study utilised a qualitative research design that was emergent in nature. Although a planned structure and initial research questions were identified, the process was iterative. Elements of "action", "evaluation", "critical reflection", "changes in practice" were inherent in the project (Koshy, 2010) and our ongoing reflective learnings informed our day-to-day practice and in turn, each subsequent conversation. We therefore considered our study to be action-based (Koshy, 2010; McNiff & Whitehead, 2005).

Data Collection Tools

Data collection conversations took place online on Microsoft Teams. This application generated a transcript and video recording. Individual reflections were written by researchers and stored in project files visible to the research team.

Research Group

As insider research, the researchers were also the study's participants. This meant no sampling or recruitment was required.

Research Procedures

Data Collection

Data were gathered from a series of online conversations and between-meeting reflections, over a period of 14 weeks, between March and June 2025. Commonalities and differences in understandings and perceptions were part of the dynamic conversation process, resulting in the collection of rich data. Guided by an agreed research team Code and Hui Protocol, respectful relationships were maintained (Hudson et al, 2010; Pohatu, 2013). Each conversation hui was began and closed with karakia (prayer) to ensure the setlled-ness of the space. The conversation focused on our teaching and learning practices and understandings. Each meeting was recorded and continued so long as either two or three team members could attend. Transcripts were checked and confirmed against our video recording for accuracy before the data analysis began.

Data Analysis

Several in-person workshops took place to establish the chosen data analysis method. Analysis was then carried out over a six-week period and included assigned individual and group tasks. Prior to thematising data, manual coding took place transcript-by-transcript utilising Word editing functions. Data was coded at paragraph, sentence, and phrase level, with multiple codes possible for units of data (Coffey et al., 1996). Coded data were then transferred to Excel spreadsheets utilising a VBA editor, where the remainder of the analysis took place. Microsoft Teams was utilised to discuss the analysis process and to determine themes, with the aid of low-tech visual tools.

Validity and Reliability Measures

Methodological rigour and trustworthiness (Nowell et al., 2017; Tracy, 2010) were ensured by choosing a research focus that the team believed "worthy" of being studied, designing and carrying out the

research "appropriately" and reflexively, and allowing for the complexities of the project's inherent interaction and perspective-taking. Rigorous analysis was achieved through continuous synchronous and asynchronous checking in, both on the data analysis, and with each other. Inter-coder consistency (Cofie et al., 2022) including data-to-theme checks were also carried out. Rich description of context, methods, and reflective work involved in the study, and triangulation with existent research and between data sources to increase "credibility" (Tracy, 2010, p. 840). Finally, the researchers remained open to discovering unexpected outcomes when drawing together all the findings.

FINDINGS AND DISCUSSION

To promote postgraduate learner agency and participation, this study aimed to gather insights about our own learning and utilisation of the UDL framework to enhance our distance postgraduate teaching and learning practices. In this section, research findings are explained. Three main themes emerged from data and the first layer of analysis, as described in detail in the text below. The themes were:

- Theme 1: Responding to the Learner's Environment | Context, Culture, Belonging
- Theme 2: Enhancing our learning and teaching using the UDL framework
- Theme 3: Realising the Value of Collaboration

Theme 1: Responding to the Learners Environment | Context, Culture, Belonging

Data showed that the UDL framework helped the team to see, understand, and respond to learners in their wider learning environments.

The learner and their wider environment

The research group's conversations showed understandings of who postgraduate learners in WBL programmes are. Often engaging or re-engaging with education later in life, learners have rich life and work experiences, established professional networks, and varied educational experiences. This influences their confidence and self-belief to be successful in an academic setting generally, and in study and academic skills more specifically (e.g., writing, research, etc.). Some ākonga come from an oral tradition and some from a much more sort of a text-based tradition in their learning. Most learners direct their own learning, but those with less confidence or knowledge about academic language, processes (e.g., enrolment, graduation) and assessment, may require supports to help them see themselves as researchers, and to develop capability in navigating the academic environment.

Postgraduate distance education is provided by suitably qualified educators. It was noted, that in WBL contexts educators include those with significant industry knowledge with a range of experience and inexperience in education. For example, expertise in a vocation but limited background in learning and teaching. Lived experiences of challenges around academic language, processes, and assessment, mirroring some learning means facilitators are well placed to understand learners, but continued to learn about teaching in their role.

The research group discussed how in their organisation, referrals can be made to student support who provide ākonga with learning advice, accessibility support and counselling. However, distance learners were seen by the authors as situated within their wider "team" of family [whānau], friends, and the communities where they live. Visualising the WBL contexts of distance postgraduate learners as a Bronfenbrenner diagram, with the learner at the centre and concentric rings of workplaces, then educational programmes and so forth, helped one author consider the learner's wider learning

environment. An author also mentioned as part of pastoral care encouraging ākonga to leverage community-based services and supports as these are the one's known to the learner.

Promoting agency and engagement

Establishing a learner's trust in the system to promote agency and engagement was discussed. In the conversations were many examples of how facilitators practice effective relationship-building, through effective communication and allowing time:

> *I just think that there's real risks in learners not being successful if we don't get the first things right... because if they're not say looking at the content in the Moodle page, what comes before that?*

Concerns around the impact of institutional change for postgraduate learners arose – what might happen if learners trust in the delivery of educational services was broken:

> *if you've already established collaboration and community, and then ..trust disappears, you know [these are] people...learners.*

The postgraduate programmes both offer a work-based project which offer learner choice. In the postgraduate certificate in Learning Design for example, learners are encouraged to choose a project within their workplace (for those within a learning design or staff developer role, for example) or to choose a "passion project" instead:

> *if someone's doing a [work-based project or a] passion project, that doesn't matter; that's stretching them or making them motivated and whatever they learn there.*

Being responsive to learner needs is dependent on where the learner is in their own journey. Early in the learning journey, encouraging independence and autonomy in their learning was desirable:

> *You do want the learner to be completely independent. But to begin with, we do have learners that are quite dependent and we kinda, it's building towards that independence and interdependence.*

Later, scaffolding to guide learners to new theoretical research areas and methodologies was employed. Approaching project completion, there was sometimes a need for increased support, which might include facilitator interaction, including one-to-one online meetings, follow up emails, sharing of resources, and feedback for learners about their work.

Theme 2: Enhancing Our Learning and Teaching Using the UDL Framework

Data indicated how UDL enhanced the authors' learning and teaching practices, by supporting developing understandings, application of, and reflection on the framework.

Our developing understandings of UDL framework

The Purpose of UDL: We understood at the outset that the purpose of UDL was to enhance our learning and teaching practices, and were aware of its widespread and enthusiastic use in teacher education, where it serves as a PLD stimulus, for example in follow-up conversations with in-service teachers. We knew many experienced teachers have deeply embedded UDL into their practice. Importantly, we found a pressing need for sharing of practice with our WBL colleagues, both around UDL and other good teaching practices. A conversation of interest to the authors and one that is ongoing has been

about how UDL relates to pedagogy, and whether UDL is a pedagogical practice. Further, conversation also deeply considered UDL as a practice supporting critical reflection tool.

While UDL has it's widely known applications there were also other applications of the framework that were discussed in our conversations, namely: using UDL to design ongoing work processes with colleagues, designing questions for engagement of teachers in leadership training PLD, and – in our WBL contexts - the importance of co-design of learning pathways for learners.

UDL as a changing phenomenon: Partway into our data collection, as part of providing a PLD workshop for a small group of peers, we became aware of UDL as a changing phenomenon.

CASTs updates made the cognitivist underpinnings of the UDL v.2.2 framework more evident, and it was clear that it was originally developed from a neuroscientific perspective. The v.3.0 updates brought UDL more in line with the constructivist and socially constructivist approaches that we adhere to in contemporary tertiary education, attributed to theorists such as Piaget and Vygotsky, respectively. This also corresponds with teaching practices in early childhood education and primary school sectors:

> *You know how strongly constructivist we have been for a long time now. So it's almost like this new version has moved to how I was hearing that it was being applied in the first place.*

The authors responses to the v.3.0 UDL updates were largely very positive:

> *I just think looking at them side by side this it's a sort of a kind of night and day... there's been some quite profound changes.*
>
> *It really has moved along some ...in a good way, you know better serving, better addressing diversity.*

As educators, we found enhancements in our learnings of UDL through the exercise of looking at the updated 3.0 version and doing a matching “compare and contrast”. We also noticed that, until the updates, we had not previously looked at the v.2.2 UDL framework and asked, “what is missing?” We commented that it is important for CAST to make visible the theoretical “roots” of each UDL version, and searched for acknowledgement of key underpinning theorists on the CAST website.

CAST”s intentions for enhancing teaching practice likely underlie many of the significant language changes: for example, in v.2.2 “mastery orientated feedback” is replaced by “action-oriented feedback” in v.3.0. This update was seen as moving on from “dated 1980”s instructional design viewpoint[s]... of becoming the master or the expert”. More contemporary, constructivist language is present in v.3.0, e.g., “Cultivate multiple ways of knowing and making meaning”. We noticed however, “Information processing” and “visualisation” to be both absent in the 3.0 version. It was identified that such omissions may be significant when designing for particular learners who may have differences in processing.

The UDL framework as a guide: Time was taken examining the structure of the UDL framework, and its arrngement into 3 UDL principles, 3 horizontal tiers, with corresponding guidelines (formerly called “checkpoints” in v.2.2). Below is a summary of enhancements to our learning and teaching using the UDL framework:

It clarified that building relationships, which is all-important for all learning-and-teaching things to happen, was present in the green (engagement) column of both versions.

Renaming of the three tiers from "Access, Build, Internalise" (v.2.2) to: "Access, Support, Executive function" (v.3.0) has increased prominence of executive function, now sitting across 3 principles, and will likely be familiar language for recent teacher trainees, but may not be familiar language to experienced in-service teachers.

The UDL updates also catalysed rigorous discussions around:

Understanding the foundations and philosophical underpinnings of pedagogical tools:

> *surely we can't just throw out everything we've learned from cognitive theories, or cognitive behavioral theories and just say they are now irrelevant.*

Identifying what is missing, as well as noticing what is present:

> *As a educator, [if they] couldn't look at that and say: what [are] its strengths, but more particularly, what its limitations are, then is our education training doing what it needs to?*

Evaluating our day-to-day practice, by being aware how we are using UDL and "layering it with all the other approaches that we've learnt in our practice"

Applying UDL

Catalysing conversations: Using the UDL framework as a referent, we were able to have challenging conversations about our actions when planning for learning around ākonga challenges and needs. By focusing on the green column, in the "Executive function" tier, the guidelines provided an outline for one author's "co-design process" of the learner's work-based project. Such a "co-design approach" was related to developing the learner's agency, with a focus on executive function:

> *I always think the executive function one is sort of hoping that the learner is getting to that point of recognising their expectations, their own expectations of the learning environment and their own beliefs around themselves as a learner.*

Examples of sharing relevant to guidelines:

Anticipate and plan for challenges (6.2) - "there's some aspects of UDL that talk about like self management and things like that, where does our role and responsibility finish, and where does the learners pick up in regards to their world?"

Organize information and resources (6.3) - "*Looking at different kinds of texts...reflecting on what it is that's really, really happening with it...[is it an] in-built belief that's more the issue, than an actual [barrier]".*

In the same green column, "Executive function" tier, the final guideline: "Challenge exclusionary practices (6.5)", provoked robust discussions on perspectives on individuals with different abilities who may be "disabled" by the education system.

There was also comment about the difference between inclusion and the exclusionary language used. Concern was that exclusionary language does not go far enough to curb practices, and that inclusionary practice should be more strongly promoted by CAST through UDL, which has become a go-to for diversity and neurodiversity. However, this does not obviate risks of exclusion; we asked how then can you use UDL to promote inclusion?

UDL and Cultural Responsiveness: With the UDL framework as a referent, we clarified that culturally responsive practise can be overlaid with UDL. CAST have recently made v.3.0 additions that address

cultural responsivity and sensitivity towards different languages and cultures. One author commented: "*I'm not sure if it's the sort of an overlay or if it's actually fully integrated into it*".

Another author described how, in a previous role, ākonga were asked to describe how UDL and Kaupapa Māori principles aligned, for example "*how manaakitanga fitted with UDL and they had example after example.... from the classroom"*. In considering the UDL framework further, principle - Multiple Means of Representation and guidelines "clarify vocabulary, symbols, and language structures (2.1)" - cultivate understandings and respect across languages and dialogues (2.3) demonstrate how UDL supports the incorporation and promotion of Indigenous tikanga and te reo Māori.

We identified four key areas in which UDL could guide our cultural responsivity:

- Addressing bias, threats and distractions (7.4) & Cultivate empathy and restorative practices (9.4) - all three v.3.0 UDL principles now acknowledge the need to create a safe learning environment
- Building relationships, vitally important for all learning-and-teaching things to happen, was abundantly present in the green (engagement) column of both versions.
- Creating ākonga trust in the system/staff is one area supported by UDL v.3.0's new "nurture fun and play" (7.3) by ensuring "the learning process is something that will engage you and therefore needs to be enjoyable, something can be passionate about"
- Developing ākonga self-belief in academic skills is supported by UDL, by promotion of agency, internalising executive function strategies, and development of resilience. As an example, one author noted her learners' actualisation of "*self as an academic learner*" only from the end of Course 2, along with developing their writing, referencing and research skills.

Supporting self reflection

In using the framework principles and considerations as ignitors for conversation, we identified three key areas which showed how the UDL framework guided us in our reflective processes.

Building self awareness: Discussions showed the authors were able to relate their experience to high level thinking in the UDL framework:

> *All of those things you're talking about that probably fits with the executive functions both for the facilitator and for the learner.'*

Noticing of one's own processes: Other examples highlighted the critical thinking and reflective skills of the authors in action:

> *I was noticing my reactivity, and ... it was because it was tapping into my why, which ...always comes back to inclusive education.*
>
> *UDLs meant to be about giving the learners access to their own thoughts and their support for their own thinking. Ohh, it just made me go. Yeah, [I'm] guilty sometimes of doing that thinking for them*
>
> *I kinda erred on the side of being not too reflective, but too self critical.*

Using the UDL framework as a guide to support self-reflective analysis: In the act of discussing our understanding and application of the UDL principles to facilitation, and resource creation we found it could be used for self-reflection in our context widely.

it was good to see it [UDL] used as reflective tool

Literacy in tertiary spaces*: "with the representation it obviously comes into that potential for dual coding, you know, with the visual being enhanced by whatever auditory information's coming in as well... it is a really nice synergy. I think when you're enhancing any type of literacy, certainly look with UDL".*

Opportunity for expressing new learning*: "I guess to make things more visual, to get learners to do a visual assessment rather than ... writing an essay; to think about doing an infographic or putting together a PowerPoint or whatever else, whatever technology tool... So that was [the] action and expression [principle]".*

Theme 3: Realising the Value of Collaboration

Analysis also revealed a third theme, where the nature and value of collaboration in both learning and teaching practice for learners, and the team's own professional learning conversations and reflections.

Ako | Learning

Questions we asked ourselves: Ako is a reciprocal learning and teaching relationship. A planned aspect of the research was that the authors would consider the types of questions being asked in our practice, and why. In the action of recalling these, wonderings, and collective understanding arose. These questions will be analysed further and discussed in a different paper, however, below are some examples:

The place of ako in our mahi: 'is that what we're actually championing?'

Communication

We noted a change in communication with learners around assessment time. Greater numbers of emails were sent for reasons of accountability. Often conversations were the preferred communication, but there was a need to make written notes on these conversations and one author chose to share these with the learner, taking a "nothing about us without us" approach. As researchers, we also acknowledged our own differences in preferences around processing auditory and visual information. To fully realise the value of collaboration in online distance education, we need to learn to listen, work well collaboratively, value others' ideas and be open to "stretching our thinking by hearing others' experiences".

Communication barriers around assessment were identified including: understanding academic language of assessment, time constraints, and making sense of marking rubrics and matrices of graduate outcomes. The master's and doctoral programmes had some specific assessment processes designed to allow accommodations around assessment. In contrast, the one-year learning design programme relied on a system of automated reminders and a formal extension application process to keep learners on track.

Critical Conversations

In our WBL postgraduate contexts, the "Learner's team" consists of a series of facilitators who support them in their journey. As discussed previously, the learner may also choose to engage with student support services, but most distance learners do not. Mixed teaching teams have facilitators who are selected for their diverse vocational backgrounds. For example, the authors have extensive experience in education, so when working with electrical engineers, their value can be in "asking the lay question".

This leads to ako (reciprocal learning) and builds relationships. Dialogue is seen as an essential part of the transformative learning process. (Mezirow, 2018), and this was seen as interwoven in WBL:

> *whether it is someone going out to visit an apprentice or whether its people jumping in an online meeting with us facilitating... there is conversation and... transformative learning [is] woven in.*

Facilitators need to build up a learner's independence and autonomy as a teaching team through collaboration and communication, building trusting facilitator-learner relationships, and between facilitators. For the Master's and Doctorate programmes, assessment is by portfolio (submitted ahead of time), then an assessment meeting takes place with the internal and external assessors, 1-2 facilitators and the learner. The processing of the assessment portfolio necessarily needs to be collaborative. At times, the authors found challenges in understanding written portfolios. They valued the greater understandings arising from conversations during the assessment meeting.

Observations were made about communication during other online Teams meetings with work colleagues. Different communication styles in work teams were noticed. The etiquette of having a camera on or off created questions around whether colleagues were listening, and if communication was lost from not reading facial expressions. Similarly, a lack of eye contact, occurring when note-taking during meetings, can be misconceived as a lack of engagement, but note taking was generally perceived as engagement. In discussing this, we are bringing awareness to any assumptions we make around people's observed communication styles. This may be important with increased online interactions in workplaces, as we are spending more time in online conversations rather than in written communications.

Realising the Value of Collaboration for Research

As a research team, we realized the value of our collaborative endeavors to upskill around UDL where none of us considered ourselves "an expert", but collectively we all held knowledge. To articulate the need for sharing, and to share our practice, for example, at UDL PLD workshops where "everybody had something to share" - this form of collective learning and community building was seen as empowering.

- Being cognisant of our role and place in others' educational journeys "*I think the conversations are helping me kind of get out of the little...I guess, um, the cul-de-sac that I've kind of got myself into. Thank you"*.
- When setting collective expectations with collaborators and peers: "*What questions are we asking of them in terms of knowing what we can deliver and what their expectations are, but also vice versa. But us being able to say well we expect this"*.

DISCUSSION

We have realised there is overlap between our research questions, discussed below to show the relatability.

- First, we asked how the UDL framework enabled our commitment to uphold the principles of Te Tiriti of Waitangi in our learning and teaching environments.

We concluded that when considering Te Tiriti o Waitangi, our focus was not on whether UDL applies, but whether the learning and teaching environment upholds Te Tiriti.

From both the literature and our findings we surmised that each of the 3 derived Te Tiriti principles were evident in UDL-designed learning environments:

- Active protection of te reo Māori, the Māori language, and tikanga Māori [Māori customs] can be addressed through 2.1 and 2.3 the UDL framework.
- Participation is emphasized through culturally-responsive facilitation practices (7.4 and 9.4 and the UDL engagement principle, as seen in our findings on communication, co-design).
- Partnership, the third derived Tiriti principle was evident in co-design with ākonga, achieving effective collaboration in learning and teaching.

Without this intentional design of culturally responsive learning environments, some postgraduate ākonga would not graduate. Through practicing Te Tiriti principles and with view of equity in outcomes in our tertiary settings, we can meaningfully achieve improvements in postgraduate qualifications for Māori and Pacific graduates, with potential impact on social and economic development ('Higher education improves …', 2025). We note that other researchers such as Benton Kearney (2022) are key proponents of UDL with established tools and resources beyond those developed by CAST, promoting inclusive and indigenous pedagogies in response to diversity to promote equity and accessibility, which should help implement UDL in existent organisations and systems.

- Second, we asked how the UDL framework can be utilised as a reflective tool to enhance our teaching of ALL postgraduate learners studying by distance in WBL programmes, but particularly Māori, Pacific, and Disabled ākonga:

Without WBL opportunities, some learners might not engage in postgraduate studies. By acknowledging learner diversity within diverse postgraduate cohorts the UDL framework was seen as a way to help educators to reduce barriers posed by an inflexible "one size" curriculum (Flanagan & Goldthwait-Fowles, 2023) and instead design one that is flexible, inclusive, engaging, and challenging for all learners (Sheridan & Gigliotti, 2023). This is achieved through designing for learning, cognisant of individual variance which recognises diversity (Lambert et al., 2023). Our finding is that UDL begins where each learner is at and builds on strengths (theme 2). For those learners needing inclusive supports to access and engage in tertiary education, this is essential. Strength-based practices also develop learner capability in negotiating processes, systems, and academic culture. This is enhanced when the postgraduate project is based in the workplace and is further collaborative in nature (theme 3), as learning extends to all those in the learner's context (theme 1).

The literature shows confusion amongst faculty about what UDL entails and who is responsible for inclusive education (Lomellini et al., 2025). In the act of using UDL as a reflective tool, all educators are able to look back, in order to move forward. Our findings complement those of Lomellini et al (2025) who have found that even a few hours' training can upskill faculty, which we posit is enhanced through dialogue about inclusive learning and teaching practices.

Ako is deeply embedded in the act of learning about the UDL framework. When using UDL, educators learn about making intentions become actions, and move from subject matter experts to learning designers. We hope other educators will engage in the act of collaborative professional learning. We found our focus was relational. Working with each other required listening to each other and in the act of co-designing our research we saw alignment with co-designing curriculum, processes and learning journeys.

- Third, we questioned how valuable the UDL framework could be in our day-to-day work, supporting ākonga engagement, participation, and agency.

We found that UDL ignited some difficult conversations and brought criticality to our reflections on UDL, research and our teaching and learning practice. We found great value in these UDL conversations:

1. to hear others' perspectives,
2. to seek out further clarification,
3. to help us move on and refine our thinking, and
4. to more clearly define and position our personal educational philosophies.

It was evident very early in the research that we were layering the UDL framework alongside other known and effective pedagogical tools, when designing learning opportunities for and with ākonga. As a group, we considered that UDL proactively, rather than reactively, aims to set high and achievable goals for each learner to engage and participate fully in the learning experience, as identified by Ryder et al (2023). In this way UDL addresses learner variability and enables educators to meet these varied needs, so enhancing our learning and teaching practice (theme 2).

Using the UDL framework anchored us in certainty and strengths-based thinking during volatile times and changing work-based contexts. This assisted us in finding a sense of belonging in our research and mahi (theme 1). We also valued the UDL framework as a provocation to identify and challenge inequities and bias (theme 1), and widely seek support and share our practices (theme 3).

For all these reasons, we consider the UDL framework to be relevant to all levels of education.

CONCLUSION, IMPLICATIONS AND SUGGESTIONS

The researchers have found that the UDL framework, in its third version, is backed by literature and a sound methodological practice. UDL has been a useful tool for facilitation and learning design practice. In its design, UDL is a strong tool for critical reflection, and can be used collaboratively, for reflection on and co-design of learning experiences. It is an ignitor for conversation, and it is the conversation that changes perceptions and actions. We consider this dialogue to be transformative for teaching and learning (Mezirow, 2018). The UDL framework can also be used to critique education practice, process and resources. UDL serves as a critical tool to judge the strengths and limitations of existing pedagogical tools. Functionally, it is invaluable for accessibility and as a learning design model. In short, the UDL framework can be adapted in its use.

Limitations: We have some experience with deficit thinkers in our day to day-to-day mahi, which we attempt to counter with inclusive practices, as mentioned by Lambert (2023), such as the use of UDL. In our specific contexts (learning design and facilitation), we found we were able to lead discussions about the UDL framework with ease. This is in part due to the flexibly designed courses we teach in. We have not allocated time to discuss less flexible roles and programmes. Nor did we address the constraints and implications of systemic barriers and limitations of change processes, as these are considered out of our control.

Implications and Suggestions: The authors advocate for the use of Universal Design for Learning in training of tertiary educators. The basis for this training suggestion is that through collaborative practices, educators can ensure the learner remains at the centre of designing learning opportunities. Cultural competencies underlie conversations in this PLD. We consider there is benefit in upskilling staff about the utility and application of the UDL framework, as a tool for inclusive education, as identified by Lomellini et al (2025). In discourse ignited by the UDL framework, important

considerations about inclusive teaching practices can be proposed, widening subject matter experts' perspectives about what is in their scope of practice.

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Policy, Practice, and Quality in a Distant Education Model: Challenges and Innovations in Teaching International Students

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ABSTRACT

This study investigates how institutional policies, instructional design, and digital delivery technically demanding engineering course impacted learning of international students taught through a blended distant model during the COVID-19 pandemic. Using a mixed-methods approach which included questionnaires, assessments, observations, and interviews, this research highlights challenges in comprehension, engagement, and discourse development amongst international students. Findings reveal that while blended delivery improved access to content, instructional gaps and mismatch with prior knowledge limited learning for non-civil engineering students. The study underscores the need for clear and aligned admissions criteria, interactive content, and tailored support for international students.

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INTRODUCTION

The COVID-19 pandemic prompted a rapid shift to online, distant and blended learning models in higher education, compelling institutions to rethink and strategize how they deliver education, particularly in engineering disciplines where field experience, applied knowledge, technical reasoning, and procedural skills are crucial (Barton, 2020; Gonzalez et. Al, 2021). These changes during COVID introduced both opportunities and barriers for international students enrolled in intensive programmes such as graduate- level engineering diplomas. This paper investigates a case study from a Level 7 Graduate Diploma in Civil Engineering programme delivered through a pure block-mode format in New Zealand. The course was undertaken mostly by international students from diverse linguistic backgrounds, including students without prior discipline specific civil engineering degree or relevant civil engineering field experience.

Although the qualification is positioned as a bridge to postgraduate study, the programme assumes familiarity with engineering terminologies, and field-relevant materials to some extent. A rapid and fast paced block delivery and reliance on distant teaching tools like PowerPoint lectures and asynchronous learning modules and online video recorded lectures limited opportunities for practical engagement and compounded cognitive demands. These delivery choices during COVID-19 raised concerns around current delivery model, inclusivity, comprehension, and assessment equity, particularly for students who were unfamiliar with the New Zealand civil engineering infrastructure context and discipline specific terminologies.

This paper draws on assessment data, student questionnaires, student and lecturer interviews, and classroom observations to investigate the impact of instructional design and institutional policy on engineering student outcomes. The findings highlight two major challenges, gaps in engagement and the role of prior discipline specific knowledge, and proposes strategies to improve distant engineering education.

LITERATURE REVIEW

The expansion of online, distant and blended learning has increased access to higher education, particularly for adult, international and non-traditional learners. However, in disciplines such as engineering, the transition to digital formats poses immense challenges (Asgari et al., 2021; Fox et al., 2020). These challenges include the difficulty of explaining hands-on physical concepts, procedural, and material concepts through online or written formats (Means et al., 2013; Zawacki-Richter & Naidu, 2016). While digital and e-learning can be effective for theoretical instruction, it often lacks the multimodal engagement required to compliment complex, practice-based engineering content for learning (Mayer, 2014).

Block-mode delivery has emerged as a strategic flexible model for supporting students from mostly non- traditional backgrounds (Samarawickrema & Cleary, 2021). In this delivery model, students complete course content units in a short time frame through intensive blocks. Victoria University in Australia adopted this model in 2018 and reported significant improvements in pass rates and content engagement, particularly among students from equity and linguistically diverse backgrounds (Samarawickrema & Cleary, 2021; Victoria University, 2023; Walker-Gibbs et al., 2019). Southern Cross University implemented a similar six-week block delivery model which led to improvements in GPA of 18–27% among diverse cohorts (Southern Cross University, 2023). Federation University also

implemented a block format in their electrical engineering programme, enabling working professionals to engage in academic study and on-campus lab learning across four-day blocks (Federation University Australia, 2023). These flexible models address time constraints and cognitive load demands faced by students in fast-paced, technically demanding programmes like engineering. However, intensive block model teaching formats may also lead to information overload and fragmented conceptual understanding when courses are content-heavy or presented with insufficient planning and scaffolding (French, 2015). In the context of this study, the first half of the block mode delivery was disrupted during the initial period of the COVID-19 lockdown and was delivered primarily through zoom recorded PowerPoint lectures and limited face to face sessions under various COVID alert levels, with theory covering engineering content with minimal tactile and practical exposures. For students who were unfamiliar with the local New Zealand roading terminologies and construction standards, this delivery method (zoom recordings and block mode) increased their cognitive load and hindered applied engineering reasoning. This finding aligns with prior literature, which emphasize that pedagogy which supports interactivity, contextualisation, and demonstration are crucial for engagement and learning in technical education (Laurillard, 2012; Moskal et al., 2013).

Equity concerns are notable when students are enrolled to applied programmes like engineering with varying degrees of prior disciplinary knowledge and non-relevant degree to the programme they are being admitted. Devlin and O'Shea (2012) highlight that offering such opportunities without tailored curricular and instructional support may widen gaps in achievements, particularly among linguistically diverse students (including international students). In this study, several international students entered the engineering programme from mechanical, electrical, information technology or other unrelated degree backgrounds without a civil engineering foundation. Institutional admissions policies and course expectations presented challenges around technical terminologies, comprehension, assessment performance, and confidence in engineering discourse.

Furthermore, there is sufficient literature which shows that international students often struggle to express technical expertise or fluency in classroom discussions and in written assessments when discourse practices are unfamiliar (Delahunty & O'Shea, 2019; Murray, 2010). In engineering courses with considerable design and calculations, justification of design decisions and the use of domain-specific language are critical for communication, this lack of confidence in discourse can limit participation within the engineering community and affect learning gains.

This study explores how these issues manifested within a distant, intensive learning model for international engineering students, and the influence of targeted interventions (Engineering Materials Exhibit) helped clarify learning gap. The paper builds on these insights to propose structured scaffolding practices to support engineering discourse development in block-mode models.

RESEARCH CONTEXT AND AIM

This study was conducted within the Surfacing Technology course, a core paper within the Level 7 Graduate Diploma in Engineering offered by a tertiary institution in New Zealand. The course typically attracts a diverse cohort, including New Zealand domestic and international students. Domestic students are typically working professionals from the civil engineering contracting sector, while many of the international cohorts are transitioning into civil engineering specialisation. The programme admits students with engineering degrees from any discipline, meaning applicants may or may not hold a qualification specifically in civil engineering. However, a general engineering degree is a

prerequisite for enrolment into this programme. The Graduate Diploma in Engineering was historically delivered as a distant block delivery model to cater for working professional students and their needs. A typical block delivery format consisted of 3 x 3 teaching days blocks where course content would be covered, along with any closed book assessments like tests. During the COVID-19 pandemic, the first block of 3 days had to be cancelled and adapted to a video recorded blended delivery with online tutorial sessions. The video recordings of the lecture were made available to all students during the initial weeks. Further two remaining study blocks were conducted in the usual condensed block delivery where content was taught into intensive face-to-face teaching sessions.

Initial student feedback highlighted difficulty in understanding and visualising key surfacing concepts, including road aggregate types, surfacing methods, and the grades of bitumen in New Zealand road construction. This undermined the course learning outcomes and prompted a targeted intervention in the second block. A classroom tutorial was organised featuring physical samples of chipseal (stone aggregates), hot mix asphalt cores, and various grades of bitumen, sourced from a local civil engineering contractor. The session aimed to improve conceptual clarity by allowing students to engage directly with real materials, making the taught content more meaningful and manageable for students.

The primary aim of the study was to understand how students with varying levels of prior disciplinary knowledge experienced this delivery model and to examine the impact of the instructional intervention (engineering materials exhibit) on their understanding and engineering discourse development. The research sought to answer the following research question- How do differences in prior engineering knowledge affect student learning and discourse confidence in a block-mode technical course, and what role does instructional design play in supporting equity and engagement?

RESEARCH DESIGN

A qualitative mixed-methods approach was employed to collect data to allow for both numerical analysis of performance data and in-depth investigation of learner insights and experiences (Creswell & Plano Clark, 2017). The study combined pre- and post-intervention performance data with responses from the two questionnaires (pre and post intervention), two class tests, classroom observations, informal classroom discussions, and interviews with teacher and students. This triangulation of data enhanced the validity and richness of the findings, which is particularly important when dealing with varying learner backgrounds (Denzin & Lincoln, 2018).

Participants and Sampling

A total of 14 international students and the course tutor participated in the study. To ensure a representative sample from this class, participants were selected using a systematic sampling strategy from a cohort of 39 students. A purposeful stratified sampling approach was used to recruit participants (Patton, 2015), from a class of 39 students. Students were grouped into strata based on initial academic performance from an initial assessment, and then participants were selected from each stratum to ensure fair representation across a range of academic performances. This sampling approach was chosen to capture variation in learning experiences, particularly how students with different levels of prior disciplinary knowledge engaged with the course delivery. This method is suited to explore educational research where depth and diversity of perspective offer value to answer the research question (Patton, 2015). All participants were given informed consent, and they agreed to

participate in the study and the researcher was not involved in teaching and maintained a non-instructional role to ensure ethical integrity and to reduce observer bias.

Participants included both students with prior civil engineering degree and those from unrelated engineering backgrounds (like mechanical, electrical or electronic engineering). This diversity in student participants was central to the study's aim of examining how students' prior disciplinary knowledge shapes learning in a condensed, block distant education model.

Data Collection and Analysis

Data were collected across three phases: (1) Questionnaire 1 and through ongoing classroom observations; (2) a engineering materials exhibit which supported tactile engagement with road construction and surfacing cores and materials; and (3) Questionnaire 2, closed-book Test 2, interviews, and assignment analysis carried out between weeks 9–13 which assessed conceptual understanding, discourse development, and student perceptions of the intervention's impact on their learning.

Data collected was analysed using a thematic approach (Braun & Clarke, 2006) to identify emerging patterns related to instructional design and prior engineering knowledge disparities. Quantitative data from the questionnaires and class tests were analysed thoroughly and used to support and contrast with qualitative findings, following a convergent parallel design (Creswell & Plano Clark, 2017). The responses derived from the class tests and student interviews were further categorized by disciplinary background (civil vs. non-civil) to explore equity-related trends.

Development of discourse relevant to engineering was specifically analysed through written test scripts and student interview transcripts, looking for use of engineering vocabulary specific to road engineering, exploring structured reasoning, and confidence in engineering justification.

Theoretical Framework

This study is informed by three intersecting frameworks which complement each other, Constructivist Learning Theory, Cognitive Load Theory (CLT), and the Community of Inquiry (CoI) Framework. These frameworks help interpret how students engage with distant, block-mode delivery, especially when students are allowed to enrol with varied engineering backgrounds.

Constructivist theory argues that learners actively build knowledge through experience and prior knowledge, social interaction, and contextual application (Biggs & Tang, 2011). Disciplines like engineering requires students to integrate conceptual and procedural knowledge, so constructivist learning environments enable deeper and meaningful understanding through applied, visual, and collaborative tasks (Jonassen, Strobel, & Lee, 2006). This theory will help to understand how the hands-on engagement with physical road surfacing materials assisted with clarifying any abstract engineering concepts.

Cognitive Load Theory (Sweller, 2010) helps to explain the barriers students face when more complex engineering content was delivered online through PowerPoint presentations. This theory will help reveal if the overreliance on PowerPoint-based instruction without accompanying examples or interactions added unnecessary cognitive load, which could have limited comprehension and discourse development.

To address distant education more directly, the Community of Inquiry (CoI) Framework (Garrison, Anderson, & Archer, 2000) is also applied. This framework highlights the role of teaching presence, cognitive presence, social presence and the role these play in creating meaningful learning. The Community of Inquiry (CoI) Framework will assist in this study to understand if the lack of real time and limited interactions in the course limited social presence.

These frameworks will complement each other and will jointly inform the interpretation of learning disparities and guide recommendations for scaffolded, interactive, and inclusive instructional design in engineering education.

FINDINGS

Introduction to Findings

The data were collected from multiple sources, which included course assessments, two student questionnaires, classroom observations, informal discussions and post interview with students and the course lecturer. The findings presented in this paper focuses on two interrelated challenges, the gaps in instructional design and inequities in learning outcomes due to varying levels of prior disciplinary knowledge leaners brought in the class. The analysis is thoroughly grounded in a comparative reading of pre- and post-intervention performances and participant reflections on the intervention. Observations made from the study are grouped under two key findings- gaps in instructional design and inequity in admissions policy.

Finding 1- Gaps in Instructional Design and Engagement

Initial analysis of student Questionnaire 1, administered in week 4, revealed that majority of students (71.4%) were neutral or disagreed with the statement that the content was effectively communicated. This contrasted with their agreement that the lecturer encouraged discussion in class, suggesting there could be structural issues with the delivery of the engineering content. Several students from this class explicitly commented that PowerPoint driven delivery (in both online and classroom) lacked sufficient explanation or visualisation, especially for complex engineering topics such as chipseal design and bitumen properties. Student YKJ noted the ineffectiveness of PowerPoint explanations to explain design calculations, expressing a preference for pen-and-paper or more detailed breakdowns and explanations when it came to analytical numerical design calculations. Students SA and HY specifically mentioned difficulties with understanding chipseal design numerical calculations with examples of their specific applications to engineering context.

Observational data from early teaching weeks reinforced these perceptions. Students were generally passive, with limited questioning and few signs of engagement. It is worth mentioning that the lecturer often stopped the lectures for the students to ask any questions, but there was little to no questions from students. During informal classroom discussions with the students, many appeared to lack confidence in using technical language verbally, struggling to apply terms like ‘void content’ or ‘binder penetration’ within the context of the conversations. This was also reflected in their first closed book test, where several students including PA, GSP, and YKJ, either left core conceptual questions unattempted or provided vague responses including repeating phrases without explanation or were mostly definitions unrelated to the question. For example, in a question asking students to differentiate road surface properties (macrotexture and microtexture), PA responded only with ‘*aggregate spacing*,’ while student GSP did not attempt the question altogether.

After a targeted intervention involving display of road surfacing construction materials (engineering materials exhibit), some improvements in technical discourse were evident. In Questionnaire 2, administered after the exhibit and their closed-book Test 2, most students reported that the materials exhibit helped clarify roading concepts such as chip size, HMA types, and various bitumen grading. 10 out of 14 students rated it 4 or higher in a Likert style response (scale 1-5) and multiple students cited visuals, physical samples, and interactivity as helpful. Further in Test 2, Student HY scored 2.5/3 on a question which evaluated their understanding of chipseal design variables and factors, compared to a vague response they provided in initial Test 1. AB and HS demonstrated similar improvement in both their written answers and verbal reflections during their interviews, appreciating the ability to physically see and touch materials (like epoxy binders, OGPA road core samples) helped them better understand texture, void content, and aggregate classification. CV also stated that the samples made understanding bitumen grades feel '*real*' and to further make a link to understand which seal type are most suited for different options (like surfacing for intersections versus high-speed roads or motorways). However, engagement varied as per the lecturer and supported by the observations made on the day by the researcher. The lecturer noted that some student groups participated actively during the demonstration, asking questions and linking classroom material to real-world scenarios, while others merely observed or interacted with the samples passively.

Despite the intervention and its perceived significance, many students continued to show inconsistent applied reasoning in their assessment tasks. In Test 2, students such as GSP and PA scored 0/3 in critical reasoning type questions related to binder grades and surfacing applications. Their answers were either incomplete or incorrect. Even when students recognised technical roading terms and terminologies, they often struggled to connect them to the right engineering logic or site-specific applications. Similarly, PC showed a lack of structured reasoning in his answer about surfacing types (OGPA and SMA) and applications and provided mostly general descriptions without connecting making logical connections to some factors emphasized during the material exhibit. In interviews, some students, such as PC and HS, expressed that while the sample exhibit helped with understanding terminology, they still needed field visits and exposure to understand how to apply knowledge to design contexts. Students highlighted that associated designs to support or compliment field visits.

Inequity Due to Prior Knowledge and Admission Policy

Disparities in student performance was evident between students with civil engineering backgrounds and those from unrelated disciplines (degree other than civil). In Questionnaire 1, students with civil experience (HY, AB, HJ, NS, NAN) were more confident with roading concepts. Students attributed that they have done similar papers at a lower level during their bachelor's study, so the terminologies were common. In contrast, there were seven students in this class who were from a non-civil engineering background, and students like JS (with a mechanical background) and PA (other engineering background) cited difficulty understanding even basic roading terminology within the context of engineering design. JS explicitly noted that his non-civil engineering background made it harder to follow the presented curriculum, while other students (GSP and VC) requested more examples or simplified explanations.

This disparity was further explored and confirmed in Test 1. Civil-background students like HY and AB scored higher across questions related to understanding surfacing principles, road aggregate types, and application scenarios. Student HY, for example, correctly described the influence of roading

aggregate shape and angularity on road texture and driving experiences, using appropriate engineering technical terms with clarity. In contrast, PA's responses were often fragmented or absent for certain questions, with responses listing unrelated facts.

The gap persisted even after the engineering materials exhibit and sample display intervention. In Test 2, student HY (civil background) continued to outperform peers with non-civil backgrounds, scoring over 80% on design-related questions and scenarios. GSP and PA (non-civil degree), despite recognising improvements in road engineering terminology, failed to translate them into structured reasoning in a written format. Their written responses remained general, with repeated phrases like 'used in intersections' without follow up explanations and descriptions. The final open-book assignments further highlighted this divide between the students. Assignment 2 required application of bitumen selection logic and associated chipseal design calculations. Students like HJ and HS applied relevant formulas with correct field justifications for their choices, while others used arbitrary values or simply copied text from slides and coursebook without any explanation of their design choices.

The interview with the lecturer towards the end of the semester provided additional insight. He observed that students with practical field engineering experience and prior exposure to roading materials were better able to visualise the engineering content, applications and asked questions during discussions. Teacher noted '*I think they understand concepts when they see it, but they don't know how to talk about it. Some didn't know what a seal looked like until the sample day,'*. This was also confirmed through classroom observations. It could be said that prior exposure, not just in theory but in physical road engineering context plays a significant role in engineering discourse development.

Finally, the initial questionnaire data also reflected that several students felt unprepared due to the intensity of the block course, engineering content and lack of practical experience. When asked if prior roading experience would be helpful, 11 of 14 participants said 'yes'. PA, JS, and NA explicitly mentioned that a lack of civil engineering background made the course comprehension difficult, while HY and HJ noted that their prior field experience and civil engineering degree exposure helped them link the taught concepts.

DISCUSSION

The two critical themes which emerged from the data set are (1) the impact of instructional design on student engagement and learning, and (2) inequities in knowledge acquisition linked to prior disciplinary background. In this discussion section, the paper will try to interpret these findings through the lenses of the theoretical frameworks proposed earlier to contextualise the data within existing scholarship.

Instructional Design Gaps and Student Engagement

The study highlights that delivery of instruction, and its design had a significant effect on students' ability to engage with complex engineering content and its application to contextual scenarios. Despite the lecturer encouraging participation in class (when COVID 19 lockdowns were removed), students reported confusion in understanding engineering design concepts, especially in relation to chipseal design and bitumen properties. The prevalence of PowerPoint-driven recorded video lectures without any practical or interactive components was highlighted as a learning barrier for international students. From a Cognitive Load Theory perspective, it could be said that this instructional approach likely increased cognitive load, thereby limiting students' capacity to process complex procedural content

(Sweller, 2010) in this study, the uptake of engineering content which involving design. The challenge was especially pronounced among students with no civil engineering background, and those who had no conceptual scaffolding to support their understanding.

The engineering materials exhibit helped to address these issues to some extent. Data from Questionnaire 2 responses and Test 2 performance suggest that when students physically engaged with road surfacing materials, such tactile engagement enabled students to internalise abstract concepts related to seal design more effectively. According to Constructivist Learning Theory, meaningful learning occurs when learners interact with real-world objects and contextually relevant tasks (Biggs & Tang, 2011). The engineering materials exhibit served as an opportunity for learners to conceptualise engineering concepts through sensory tactile engagement and dialogue.

However, this intervention alone was not the only solution. As per the CoI framework, effective online education requires cognitive, social, and teaching presence (Garrison et al., 2000). In this study, the lack of interactive lectures incorporating design calculations and structured technical discussions which meant less opportunities to actively engage with the content. This limited the lecturer's ability to guide instruction (teacher presence) and students' ability to critically understand and apply concepts (cognitive presence). Although the sample display exhibit promoted curiosity and interest, it did not fully replace the need for field visits and practical field experience which seem to be crucial factors for developing relevant disciplinary discourse confidence and structured engineering reasoning within relevant contexts.

These findings align with prior literature on engineering education and challenges faced during the pandemic. Fox et al. (2021) noted that engineering programmes struggled to transition practical components in engineering into online formats during the pandemic, which led to often rushed content delivery, superficial engagement and learning gaps amongst students. Similarly, Jonassen et al. (2006) emphasized in their study that hands-on and problem-based learning is critical in technical education, yet continues to be underutilised in distant education models (Ismael, 2023; Sukackė et al., 2022). The data from this study corroborate these findings and suggest that delivery condensed into block formats, can deepen the gap between abstract theoretical content and students practical understanding.

Inequity in Knowledge Acquisition and Admissions Policy

The second major finding of this study was the uneven distribution of knowledge outcomes between students with civil engineering backgrounds and those from unrelated engineering disciplines. Students from civil backgrounds (like students HY, AB, HJ) generally performed better in assessments (both open and closed) and displayed stronger technical and engineering discourse. Their prior disciplinary exposure to civil engineering core concepts related to road materials and design, and associated terminologies provided a foundation for structured reasoning and developing further discourse. In contrast, students such as PA, JS, and GSP, who had no prior civil experience and disciplinary background, consistently struggled to apply civil engineering concepts within the context of road design and justify their design choices.

This reflects a broader issue in bridging qualifications between bachelor's degree qualifications and higher postgraduate level qualifications. While Graduate Diplomas support learners transitioning into 'new' disciplines, NZQA's entry guidelines at this level of study allow open admission to engineering

degree holders (from mostly all disciplines), but this broad approach can result in mismatches between students' previous disciplinary knowledge and the curriculum's assumed baseline engineering knowledge (NZQA, n.d.). In this study, the programme admission policy allowed students from diverse engineering academic backgrounds to enrol, with limited formal disciplinary scaffolding in the form of foundational modules or knowledge to close this gap. This study acknowledges that all learners were required to do 15 credit courses 'fundamentals of road engineering' but often this course was taught in parallel to the course in this study.

The implications of this finding can be considered substantial. Without systematically acknowledging and addressing prior knowledge inequities, pedagogical and instructional practices, can advantage students with disciplinary alignment while disadvantaging other students who could be otherwise be capable, but underprepared. Scaffolding is essential to fill these gaps as proposed by the constructivist model (Vygotsky, 1978). Without strategizing scaffolding, the cognitive load becomes unrealistic to manage, especially in compressed block mode formats where complex engineering content is delivered at a fast pace.

Moreover, such inequity potentially limits opportunities for effective knowledge negotiation and identity formation. As Gee (2008) argues, developing a professional identity requires more than the mastery of the content, especially in the field like engineering, as it requires fluency in the language and discourse, norms, and reasoning practices of the discipline. The findings from this study suggest that non-civil engineering students often remained passive during classroom discussions and during exhibit demonstrations and were less confident in using technical expertise and discourse. This finding is consistent with the CoI model's emphasis on the significance of social presence as an enabler of engagement.

Integrating Findings and Addressing Limitations

All together findings from this study suggest that interventions such as physical demonstrations can enhance conceptual understanding, however they are not sufficient in themselves to address knowledge gap. Effective distant education engineering programmes require a systems approach that integrates curriculum design, entry criteria and admissions policy, instructional methods, and ongoing academic support.

However, the limitations of this study must also be acknowledged. The study involved a small cohort (n=14), which limits of these findings. While the mixed-methods design provided rich insights, further research with larger and more diverse populations is needed to validate these findings. The lack of a control group also means that observed improvements in students' performance in Test 2 cannot be definitively attributed to the materials exhibit alone. Confounding variables such as language proficiency, student study habits, unprecedented Covid-19 lockdowns and unreported prior knowledge may have influenced outcomes.

However, these findings strongly support existing research on the limitations of online engineering education implemented during the pandemic (Fox & MacManus, 2021; Jonassen et al., 2006), and also contributes new insights into how constructivist strategies such as the use of engineering sample exhibit can only partially compensate engineering fieldwork in a block delivery distant model. This study specifically examines international learners with diverse entry qualifications in engineering and are put through a fast paced accelerated, distant model. The integration of Cognitive Load Theory,

Constructivist Learning Theory, and the Community of Inquiry framework offered a unique understanding of why some learners struggled to engage with engineering content and developing discipline specific discourse and highlighted how carefully designed tactile interventions like the engineering sample exhibits can help with conceptual understanding, even when applied engineering knowledge gaps persist amongst students.

Transition and Practical Implication

Engineering materials exhibit intervention helped in improving conceptual understanding but was not enough to fulfil gaps in applied knowledge, hence additional hands-on learning and targeted field visits may be needed. This paper also highlights a critical policy-practice gap. Students were admitted who were not necessarily from a civil engineering background, yet the faculty and curriculum generally assumed students to be familiar with civil engineering concepts. This misalignment calls for targeted resourcing and scaffolding strategies early in the academic journey of international learners, especially for distant learners doing condensed courses like block courses.

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Review of the Legislation and Quality Framework for Distance Education in Brazil

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ABSTRACT

This article examines the recent review of Brazil's regulatory framework for distance education, highlighting the central transformations introduced and their implications for higher education. The analysis begins by situating the new legislation within the broader trajectory of Brazilian online learning, emphasizing how distance education has evolved from a flexible alternative to a strategic component of the national higher education system. It then examines how the revised framework reconfigures the balance between institutional autonomy and government oversight by establishing more stringent requirements for accreditation, quality assurance, and program delivery. Particular attention is given to the mandatory proportion of face-to-face and synchronous regulated activities, the redefinition of faculty roles and responsibilities, and the structural requirements for learning centers, which collectively signal a stronger emphasis on academic rigor and student engagement. At the same time, the framework imposes new limits on expansion in areas such as health, teacher education, and engineering, raising questions about equity and access. The discussion highlights both the challenges posed by increased regulation and the opportunities to enhance the credibility, international alignment, and long-term sustainability of distance education in Brazil. By addressing the intersection of policy, accessibility, and quality, the article contributes to ongoing debates on the role of online and blended education in national development, providing insights for policymakers, educators, and institutions seeking to navigate a rapidly evolving educational landscape.

Keywords

distance education; online learning; higher education; regulatory framework; quality assurance; faculty roles; synchronous activities; learning centers; educational policy; Brazil

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INTRODUCTION

The regulation of distance education in Brazil has undergone significant transformations in recent years, culminating in a comprehensive review of the regulatory framework. These reforms have introduced multiple changes: a redefinition of teaching roles in distance education, stricter requirements for student assessment, new minimum standards for the operation of learning support centers, an increase in mandatory face-to-face and synchronous online activities, and the reconfiguration of program delivery formats. Furthermore, new quality guidelines now require that at least 50% of the workload in distance teacher training programs be face-to-face, which challenges the scalability and flexibility historically associated with distance education. Another critical change is the exclusion of distance learning students from eligibility for scholarships under government teachers' programs, a measure that has sparked concern about educational equity and accessibility.

These restrictions reflect a policy shift that places renewed emphasis on traditional, classroom-based models, potentially limiting opportunities for students in remote or underserved areas. While increased regulatory oversight is intended to ensure higher academic standards, it may also create unintended barriers for institutions and learners, particularly those who rely on distance education as their primary means of accessing higher education. The debate is therefore situated at the intersection of quality assurance, equity, and the democratization of education.

Previous studies on distance education in Brazil have focused on issues such as digital inclusion, institutional expansion, or the effectiveness of online learning environments. However, few works have analyzed the implications of a regulatory reform of this magnitude, one that directly reshapes the organizational and pedagogical foundations of distance education. This gap highlights the importance of comparing these measures to international approaches to quality assurance, as well as their potential to either foster or hinder inclusive and sustainable educational models.

This study contributes to this emerging discussion by critically examining the evolving legal framework and its implications for accessibility, quality, and sustainability. It also considers how these policies align—or fail to align—with international best practices, with a special focus on their impact on inclusive education, lifelong learning, and the balance between regulation and institutional autonomy. Because this reform has only recently been enacted, it is not yet possible to fully assess its long-term effects. Nevertheless, providing an early analysis is crucial to situating these changes within the broader trajectory of distance education in the country. By combining national data with international perspectives on quality assurance, this article offers insights into the opportunities, risks, and contradictions that emerge from the new legislation.

In addition to this introduction, which presents the topic, research problem, objectives, and justification, the paper is organized into the following sections: a literature review that outlines the theoretical framework and state of the art; a methodology section describing data sources and procedures; a results section presenting the main findings; a discussion section interpreting the implications of these findings in light of the regulatory changes; and a conclusion that summarizes the contributions of the study, its limitations, and directions for future research.

LITERATURE

Discussions about quality in open, distance, and digital education (ODDE) emerge at the intersection of global debates and national specificities. On the one hand, international literature has produced

theoretical and conceptual frameworks that define quality in multidimensional terms and provide criteria for assuring and evaluating educational provision. On the other hand, each country interprets and adapts these frameworks, considering its own regulatory, institutional, and cultural contexts. In this section, we first review key international contributions that shape the conceptual understanding of quality in ODDE and then turn to the Brazilian context (2.2), where these global perspectives interact with local challenges and policy debates.

Theoretical Framework

The international debate on quality in open, distance, and digital education (ODDE) has been systematically developed from multiple perspectives, generating a set of conceptual and methodological frameworks that guide both research and practice. These frameworks provide a foundation for understanding how quality can be defined, measured, and enhanced in diverse contexts.

One of the most influential contributions is "*Quality Assurance in Online, Open, and Distance Education*", in which Insung Jung examines different definitions of quality and quality assurance in distance education, highlighting both conceptual difficulties and practical challenges. Jung emphasizes that quality is not a neutral or purely technical category but rather a value-laden construct shaped by institutional missions, cultural assumptions, and the expectations of stakeholders. This position underscores the importance of situating debates about quality in ODDE within specific sociopolitical and institutional contexts.

Scholars widely agree that there is no single, universally accepted definition of quality in ODDE. Instead, quality has been conceptualized in multidimensional terms. Jung and Latchem (2007, 2011) proposed five major perspectives that remain central to the field: (1) quality as conformance to standards, where distance education is judged against conventional benchmarks; (2) quality as fitness for purpose, which measures the degree to which programs achieve their stated goals; (3) quality as customer satisfaction, often inspired by market-oriented approaches; (4) quality as continuous improvement, focused on institutional learning and feedback loops; and (5) quality as compliance with accreditation requirements at national, regional, or international levels, often aimed at overcoming prejudices that position distance education as “second class.” These perspectives provide a heuristic for analyzing how quality is framed in different regulatory contexts, including the Brazilian case.

In "*Evaluation of Digital, Open, and Distance Education Programs and Courses*", Melinda dela Peña Bandalaria (2022) deepens this discussion by analyzing curricula and program evaluation criteria across diverse international settings. Reviewing eleven quality assurance frameworks, she concludes that while contextual variations are significant, there is strong consensus around core elements of quality, such as learner support, curriculum design, assessment practices, faculty preparation, and institutional sustainability.

More recently, the ICDE Quality Network published "*Global Perspectives on Quality in Open, Flexible, and Distance Education*", edited by Souma Alhaj Ali (2024), which consolidates comparative perspectives from seven world regions. This report illustrates both convergences and divergences in the adoption of quality frameworks, accreditation procedures, and good practices. By mapping regional variations, it demonstrates that global discussions on quality are not monolithic but are instead negotiated in response to local needs, policy agendas, and resource conditions.

Taken together, these contributions provide not only descriptive accounts of how quality has been conceptualized but also analytical tools for interpreting how regulation shapes educational provision. For this study, these frameworks serve as the theoretical lens through which the Brazilian regulatory reform will be examined. The multidimensional perspectives on quality outlined above enable a critical examination of how the new legal framework strikes a balance between flexibility, equity, institutional autonomy, and the pursuit of academic standards.

METHODS

This study adopts a mixed-method approach, combining a theoretical review of international and national debates on quality in open, distance, and digital education (ODDE) with a quantitative analysis of recent Brazilian higher education data. The following subsections provide a detailed description of the research method, design, data sources, procedures, and validity measures.

Research Method

This study combines a theoretical review of international and national debates on quality in open, distance, and digital education (ODDE) with a quantitative analysis of recent data from Brazilian higher education. The methodological approach is therefore mixed in character, integrating a narrative review with statistical analysis of large-scale national databases.

Research Design or Model

The design followed a two-step structure: (1) identification and systematization of theoretical and regulatory references that inform the international and Brazilian debates on quality in ODDE, and (2) empirical analysis of secondary data on higher education in Brazil, with emphasis on differences between face-to-face and distance learning modalities.

Data Collection Tools

The theoretical references were identified through a narrative review of key literature and official documents on quality in ODDE. International sources included *Quality Assurance in Online Education: Global Perspectives* (Jung, 2023), *Evaluation of Digital, Open, and Distance Education Programs and Courses* (Bandalaria, 2023), and the ICDE Quality Network's comparative report *Guidelines for Quality Assurance in Open, Distance, Digital, and Flexible Learning* (2022). National sources comprised the *Diretrizes de Qualidade* [Quality Guidelines] (Brazil, 2025a), the new *Decree on Distance Education* (Brazil, 2025b), and three complementary ordinances: 378 (Brazil, 2025c), 381 (Brazil, 2025d), and 506 (Brazil, 2025e).

For the quantitative part, data were collected from two official databases: the Censo da Educação Superior [Higher Education Census] (Inep, 2024a) and the Exame Nacional de Desempenho dos Estudantes – Enade [National Student Performance Exam] (Inep, 2024b). These data were obtained through public tools and repositories provided by Inep, including Microdata, Statistical Notes, the Statistical Panel, Disclosure Tables, and aggregated spreadsheets by course and institution.

Sampling or Research Group

The dataset covered all undergraduate courses evaluated by Enade in 2023 with valid results, excluding those without an assigned concept. For the Census data, the analysis considered the totality of higher education courses registered in the 2023 edition, distinguishing between face-to-face and distance

modalities. This approach enabled comparisons across modalities while ensuring the representativeness of the Brazilian higher education system.

Research Procedures

The databases were initially processed in Microsoft Excel and subsequently analyzed statistically using Jamovi software. The procedures applied included:

a) descriptive statistics (number of valid cases by modality, mean, median, standard deviation, standard error of the mean, minimum, and maximum values);
b) application of the Mann-Whitney U test to compare results between face-to-face and distance learning courses, given the non-normality of the distributions, confirmed by the Shapiro-Wilk test and skewness analysis;
c) calculation of effect size (Cohen's d) to measure the magnitude of differences between modalities;
d) graphical representations (plots and histograms) to visualize distributions and compare groups.

Validity and Reliability Measures

The validity of the study is supported using authoritative and recognized international and national sources in the theoretical review, as well as by the reliance on official, publicly available datasets produced by Inep, which are standard references for research and policymaking in Brazilian higher education. Reliability was ensured through the use of established statistical tests (Mann-Whitney U, Shapiro-Wilk, and Cohen's d) and transparent procedures for data processing, allowing other researchers to replicate the findings.

FINDINGS

The results are organized to provide a comprehensive picture of distance education in Brazil, combining historical developments, statistical evidence, and regulatory frameworks. The section begins with an overview of the history of distance education in the country and its presence across different educational levels, followed by an analysis of the most recent datasets from the Censo da Educação Superior [Higher Education Census] and the Exame Nacional de Desempenho dos Estudantes (Enade) [National Student Performance Exam]. Next, it addresses the revision of the regulatory framework, with a focus on new guidelines for teaching in distance education, student assessment, the operation of learning centers (polos), regulated synchronous activities, and the formats of delivery established by law. The section concludes by examining the restrictions applied to specific professional programs that must be offered on-site and those that are not permitted to be offered in the distance education modality.

History of Distance Education In Brazil

The expansion of distance education in Brazil is closely tied to the diffusion of the internet, which enabled more flexible and scalable modes of teaching and learning. A decisive step was taken with regulatory changes that allowed higher education institutions to establish support centers without prior authorization (2017), substantially increasing the territorial reach of these programs. The COVID-19 pandemic further accelerated these transformations: emergency remote teaching compelled institutions, faculty, and students to engage systematically with digital platforms and methodologies. In the years that followed, this experience translated into a structural change in higher education

demand, as distance education programs surpassed face-to-face programs in new enrollments, consolidating DE as the main pathway into Brazilian higher education. Most recently, the revision of the regulatory framework has redefined parameters for institutional accreditation, program authorization, and quality assurance, signaling a new stage in the regulation and consolidation of distance education in the country.

Educational Levels

Distance education in Brazil manifests unevenly across different educational levels. In basic education, there is no consolidated culture of distance learning, as this stage remains strongly tied to face-to-face schooling. In higher education, however, DE has become the dominant modality in new enrollments, reshaping the national educational landscape. At the graduate level, *lato sensu* specialization programs have also expanded significantly, partly because they are not subject to strict regulatory oversight by the Ministry of Education (MEC). By contrast, *stricto sensu* graduate education has been more resistant. Currently, there is only one online master's program formally authorized, and regulatory trends suggest that new approvals in this field are unlikely. Beyond the formal system, distance education has flourished in free courses, corporate training, and continuing education initiatives, which are not directly regulated by MEC and therefore benefit from greater flexibility and rapid growth.

Higher Education Census

The 2023 Higher Education Census registered more than 2.4 million new students in higher education. Of these, over 70% (about 1.7 million) enrolled in distance learning programs, while fewer than 30% (around 700,000) chose face-to-face courses. Most distance learning enrollment is concentrated in the private sector, which accounts for more than 95% of the students in this modality. Public institutions, in turn, focus about 85% of their enrollment in face-to-face education.

Enade

The *Exame Nacional de Desempenho dos Estudantes* (Enade) is a nationwide standardized assessment administered in Brazil to evaluate the performance of undergraduate students in their final year. It forms part of the National System of Higher Education Evaluation and provides indicators of the quality of higher education programs across different fields and modalities.

Statistical tests applied to the continuous Enade scores revealed performance differences between face-to-face and distance education courses. The average score of face-to-face courses ($M = 2.39$, $SD = 0.931$, $N = 8{,}757$) was higher than that of distance education courses ($M = 1.93$, $SD = 0.761$, $N = 623$). The variability of results was greater in the face-to-face modality, with higher standard deviations, while distance education results tended to cluster more closely around the mean. The Mann-Whitney U test indicated that this difference was statistically significant ($p < 0.001$). The effect size (Cohen's $d = 0.50$) showed a moderate magnitude, suggesting that the difference is not only statistically significant but also relevant in practical terms.

When the analysis was restricted to for-profit private institutions ($N = 4{,}304$ face-to-face; $N = 447$ distance), the average performance gap narrowed considerably: 2.03 for face-to-face and 1.88 for distance education, a difference of only 0.15 points. Standard deviations were also similar (0.747 vs. 0.700), showing comparable internal variability between the two modalities. Although the difference remained statistically significant ($p < 0.001$), the effect size was small (Cohen's $d = 0.205$), indicating reduced practical relevance.

In the case of higher technological education courses (N = 408 face-to-face; N = 225 distance), the performance difference was again evident. Face-to-face courses scored an average of 2.59, compared to 2.25 in distance education, resulting in a gap of 0.34 points. The effect size (Cohen's d = 0.368) indicated a small to moderate difference, suggesting that even in this segment, which is more technical and employment-oriented, face-to-face courses tend to yield higher average performance than distance education programs.

Regulatory Framework Revision

The revision of the Brazilian regulatory framework for distance education was structured around three key instruments. First, the *Referenciais de Qualidade para a Educação Superior a Distância* (Quality Guidelines for Distance Higher Education) were updated, consolidating principles and parameters for institutional practice. Second, a new presidential decree was issued in 2025, redefining the legal foundations of DE, including formats of provision, requirements for physical presence, and institutional responsibilities. Third, complementary ordinances from the Ministry of Education detailed procedures for implementation, monitoring, and evaluation, thereby translating the decree into operational norms. Together, these instruments have reshaped the governance of distance education in Brazil.

Teaching in Distance Education

The recent regulatory revision redefined teaching functions in distance education, clarifying roles and responsibilities in an increasingly complex pedagogical ecosystem. The program coordinator was reaffirmed as the central academic and administrative leader, responsible for ensuring coherence and quality across the program. The content developer was defined as the specialist in designing learning materials and curricular resources, while the lead instructor was recognized as the primary academic authority in each discipline. Support for student learning was divided between face-to-face facilitators at learning centers and online facilitators within virtual environments, both of whom were tasked with promoting interaction, monitoring progress, and providing feedback. Finally, the role of tutor was restricted to administrative tasks.

Assessment

The new regulatory framework establishes the following requirements for assessment in distance education: each course unit must include at least one face-to-face examination; face-to-face examinations must occur at least once every ten weeks of a course unit; the overall weight of face-to-face assessments must be predominant in the calculation of final grades; and at least one-third of the face-to-face examinations must include questions that involve analysis and synthesis.

Distance Education Centers

The regulatory framework also establishes clear requirements for the physical and organizational structure of distance education centers. Each center must provide a reception area, a computer laboratory, spaces for students to study and meet, a student services office, at least one classroom, and adequate restrooms. In addition, centers must ensure access to a stable broadband Wi-Fi network and appoint an academic manager responsible for local operations. Finally, institutions are not permitted to share centers among different higher education providers.

Regulated Synchronous Activity

The regulatory framework establishes that *regulated synchronous activity* must be conducted with the participation of no more than seventy students per teacher or pedagogical mediator, and student attendance must be systematically monitored.

Delivery Formats

- The regulatory framework defines three official delivery formats:
- Face-to-face: requires at least 70% face-to-face instruction.
- Hybrid: requires at least 30% face-to-face instruction and 20% regulated synchronous activity.
- Distance: requires at least 10% face-to-face instruction and 10% regulated synchronous activity.

Programs Restricted to Face-To-Face Format

The following programs must be offered exclusively in the face-to-face format: Medicine, Dentistry, Nursing, Psychology, and Law.

Programs Not Allowed in Distance Education

Programs in Health, Teacher Education, and Engineering cannot be offered through distance education.

DISCUSSION

The findings derived from the 2023 Higher Education Census and Enade must be interpreted in the context of both the Brazilian regulatory framework and the broader international literature on open, distance, and digital education. Previous studies have emphasized that quality in DE cannot be reduced to dichotomous comparisons with face-to-face provision but must be understood through dimensions such as equity of access, student support, digital pedagogies, and institutional diversity (ICDE Quality Network, 2024; Zawacki-Richter et al., 2018). The Brazilian data reveal similar tensions: while DE has expanded rapidly, especially in teacher education and technological programs, concerns remain about learning outcomes, professional practice requirements, and the uneven participation of public institutions. These results resonate with comparative research in other regions, which points to regulatory frameworks, evaluation systems, and institutional missions as decisive factors in shaping the effectiveness and legitimacy of distance education.

A first dimension relates to the question of **quality and performance**. The Enade results confirm that learning outcomes in DE remain heterogeneous. While some fields, particularly technological programs, show outcomes comparable to face-to-face provision, others, such as health-related programs, present persistent performance gaps. This echoes findings from the international literature, which emphasize that the effectiveness of DE is highly contingent upon pedagogical design, student support, and the integration of practice-based components (Means et al., 2009; Anderson, 2008). The Brazilian case thus illustrates that performance disparities cannot be generalized across all areas, and that regulatory and institutional responses must be tailored to the specific characteristics of each program.

A second dimension concerns **equity and access**. The Censo da Educação Superior highlights the overwhelming role of private institutions in the expansion of DE, with limited participation from public universities. This imbalance has significant implications for social justice, particularly in critical areas such as teacher education and nursing, where public provision is crucial to ensure the equitable

distribution of qualified professionals across regions. International experience demonstrates that public investment in open universities and large-scale DE initiatives (such as the Open University in the UK, Athabasca University in Canada, or UNED in Spain) has been fundamental to democratizing higher education. In Brazil, programs such as the Universidade Aberta do Brasil represent important but still insufficient initiatives in this direction. Without stronger public involvement, DE risks reproducing structural inequalities rather than mitigating them.

A third point refers to the new **regulatory framework**, which redefines the balance between face-to-face, hybrid, and fully online formats. The inclusion of stricter rules for synchronous activities and clearer standards for evaluation aligns with trends observed internationally, where accreditation bodies and quality agencies have increasingly sought to regulate not only the input dimensions of DE (such as faculty qualifications or infrastructure) but also the processes of teaching, learning, and student engagement (European Association for Quality Assurance in Higher Education, 2015). The Brazilian emphasis on *physical presence* and *synchronous regulated activity*—a concept that extends beyond physical co-location to encompass synchronous and digitally mediated presence—illustrates an innovative attempt to update regulatory language. However, this also creates tensions, as it raises questions about whether digital presence can be considered equivalent to physical attendance, and about how evaluative frameworks can adequately capture these new forms of participation.

A fourth dimension concerns **institutional concentration and market dynamics**. Data from the Census reveal that a small number of private educational conglomerates concentrate most of DE enrolments in Brazil. While economies of scale may enable investment in technological infrastructure and instructional design, the literature warns that excessive concentration can undermine diversity of provision and lead to standardization of pedagogical models (Hollands & Tirthali, 2014). This trend contrasts with the broader international movement toward diversification of DE providers, including smaller institutions and non-formal education initiatives, which contribute to innovation and contextualization. The Brazilian case thus raises concerns about oligopolization and its potential effects on innovation and academic diversity.

Another critical issue is **evaluation and measurement**. The current reliance on instruments such as Enade, CPC, and IDD reflects a framework that is still largely designed for face-to-face education. These instruments prioritize standardized testing and inputs that do not fully capture the specificities of DE, such as asynchronous interaction, adaptive learning technologies, or student support systems, in addition to students' digital competences. This limitation has been widely acknowledged in the literature, which calls for new metrics of quality that reflect the digital and flexible nature of contemporary learning (Garrison & Vaughan, 2008; Bates, 2015). In Brazil, the development of alternative evaluative tools, such as the ABED — Brazilian Association of Distance Education — Quality Referentials and the ABED Seal of Quality, may help complement official metrics and create a more comprehensive quality assurance ecosystem.

The COVID-19 pandemic represents an additional layer in this discussion. The accelerated adoption of digital learning worldwide exposed both opportunities and fragilities. In Brazil, it contributed to legitimizing DE as a mainstream mode of provision, but also highlighted challenges related to digital divides, infrastructure, and the readiness of faculty and students. Comparative studies (Bozkurt et al., 2020) demonstrate that similar tensions were observed globally, with the pandemic functioning as a stress test for higher education systems. The new Brazilian regulatory framework, published in its aftermath, can thus be seen as a direct response to these challenges, attempting to institutionalize

digital and hybrid learning while addressing quality concerns that emerged during emergency remote teaching.

Finally, the discussion cannot ignore the **fields explicitly restricted from DE provision**. Health professions and certain regulated careers remain subject to exclusive face-to-face requirements, justified by the need for practical training and patient safety. Internationally, however, innovative models of simulation, telepresence, and blended clinical education have been experimented with, raising the question of whether prohibitions should remain absolute or evolve to incorporate technological advancements. The Brazilian case thus reflects a conservative stance, which may protect professional integrity but also limit access to high-demand fields, particularly in underserved regions.

In summary, the discussion highlights that the future of DE in Brazil depends on striking a balance between expansion and quality, innovation and equity, and regulation and flexibility. The combination of updated legal frameworks, institutional initiatives, and alternative evaluative instruments has the potential to consolidate DE as a legitimate and strategic component of the Brazilian higher education system. Yet, this requires sustained investment, diversification of provision, and recognition of the specificities of digital mediation in both policy and practice.

CONCLUSION, IMPLICATIONS AND SUGGESTIONS

This article has provided an overview of the current landscape of distance education (DE) in Brazil, drawing on official data and the most recent regulatory changes. We reviewed historical developments, analyzed enrolment patterns and Enade results, and examined the main provisions of the new legal framework, including requirements for delivery formats, teaching roles, assessment, and learning centers. By systematically presenting these elements, the article aimed to clarify the context in which Brazilian distance education is evolving and to offer a foundation for further debate and research.

The analysis highlights several advantages of the current moment. The new regulatory framework establishes clearer rules for delivery formats and synchronous activities, reinforces accountability in evaluation, and opens opportunities for pedagogical innovation and greater equity in access. Combined with national policies for digital education, it positions DE as a strategic instrument for democratizing higher education and addressing regional inequalities.

At the same time, important limitations must be acknowledged. The study is based on secondary data and regulatory documents, which may not fully capture the diversity of institutional practices and the lived experiences of students. The scope is also limited to the Brazilian context, which constrains generalizations, although parallels with international experiences can be drawn. Moreover, the regulatory environment is evolving rapidly, and some findings may be time-sensitive, requiring continuous updates.

From these findings, several suggestions emerge. Future research should monitor the implementation of the new framework, documenting how institutions adapt to its requirements and how changes affect student learning outcomes, quality indicators, and institutional sustainability. Comparative analyses with other countries—especially those facing similar tensions between regulation, access, and innovation—can provide valuable insights into best practices and potential pitfalls. Longitudinal studies are also necessary to evaluate the long-term effects of regulatory reforms on equity, regional development, and the diversification of higher education.

Finally, the potential impacts of these transformations extend beyond compliance with regulatory standards. If effectively implemented, the new framework could foster a more transparent, accountable, and socially responsive distance education ecosystem in Brazil. By integrating lessons from international quality assurance initiatives and aligning with broader policies for digital inclusion, Brazilian DE has the potential not only to expand access but also to set benchmarks for innovation and quality that resonate in the global debate on the future of higher education.

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The Role of Micro-credentials in Addressing Educational Issues in the English-speaking Caribbean

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ABSTRACT

This paper explores the potential of micro-credentials (MCs) to address educational challenges in the English-speaking Caribbean. Drawing on documents from seven Caribbean countries and relevant organizations (CXC®, COL, UNESCO), the investigation highlights both the benefits and challenges associated with micro-credentials.

Benefits:

- Improved educational outcomes: MCs can address issues like:
  - Personalized learning
  - Transition between secondary and tertiary education
  - Identifying at-risk learners
  - Curriculum flexibility
  - Professional development opportunities
  - Workforce reskilling
- Greater accessibility and equity: MCs can provide:
  - Affordable and accessible learning opportunities
  - Support for lifelong learning
- Alignment with industry needs: MCs can:
  - Help align education with current and emerging labor market demands

Challenges:

- Quality and Cost: Ensuring consistent quality and affordability of MCs requires careful management.
- Awareness and Acceptance: Raising awareness and establishing credibility for MCs among stakeholders is crucial.
- Implementation Challenges: Integrating MCs into existing systems and adapting pedagogy requires collaboration and planning.

Overall, micro-credentials offer a promising approach to educational reform in the Caribbean. However, their successful implementation requires a comprehensive strategy that addresses the identified challenges.

Keywords

Micro-credentials, Caribbean Education, Educational Reform, Workforce Development

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INTRODUCTION

Micro-credentials (MCs) have gained global prominence as flexible, targeted educational tools for lifelong learning and workforce development. In the Caribbean, where economies are shaped by tourism, agriculture, and emerging industries, MCs offer a pathway to address skill gaps and bolster economic resilience. Yet, regional MC trends remain underexplored, particularly regarding their alignment with national priorities and institutional capacities. This study helps to fill this gap by analysing 875 MCs across seven Caribbean countries, examining their distribution, subject focus, delivery formats, and institutional ecosystems.

Key findings reveal unexpected disparities: Trinidad and Tobago leads in MC offerings (35%), despite Jamaica's larger population, while Barbados and Belize demonstrate proactive engagement. The University of the West Indies (UWI) dominates the landscape, providing 67% of university MCs, with its Global Campus leveraging online delivery to reach dispersed populations. Business-related courses (38%) reflect regional demands for entrepreneurship and management skills, while industrial training underscores efforts to strengthen key sectors. However, 57% of MCs lack transparent fee information, potentially limiting accessibility for learners.

These insights illuminate how Caribbean nations leverage MCs to navigate economic and demographic challenges. Smaller countries appear to prioritize MCs as strategic tools for workforce agility, while institutional hierarchies and delivery modes shape regional accessibility. This study calls for greater collaboration among governments, universities, and private institutions to enhance transparency, diversify subjects, and align MCs with equitable development goals. By contextualizing Caribbean MC trends within global educational shifts, this research contributes to policy discussions on harnessing micro-credentials for sustainable growth.

COUNTRIES

The seven countries investigated in this research all offered micro-credentials (MCs), although with few exceptions, these were not explicitly labelled as such. Instead, short courses were typically recognized or attested to through certificates. The distribution of over 800 MCs across the countries revealed some unanticipated patterns. Contrary to expectations, Jamaica, the most populous country among those studied, did not rank in the top three for MC offerings, accounting for only 16% of the total. Trinidad and Tobago led the field, contributing 35% of all MCs, followed by Barbados at 19% and Belize at 14%. This distribution suggests a strong emphasis on continuing education and professional

development in these countries, possibly reflecting their larger and more diverse workforces that require ongoing skills training and education. Interestingly, the smaller countries in the study demonstrated substantial activity in MC offerings. This robust engagement may indicate a prioritization of educational offerings relative to their size, possibly as a strategy to enhance their competitiveness and workforce development.

The distribution of MCs across these Caribbean nations provides valuable insights into their educational priorities and approaches to workforce development. It highlights the varying degrees of emphasis placed on short-term, targeted learning opportunities across the region, potentially reflecting differences in economic structures, educational policies, and workforce needs. This pattern of MC offerings underscores the importance of considering factors beyond population size when evaluating educational initiatives in the Caribbean. It suggests that smaller nations may be leveraging MCs as a tool for rapid skill development and economic advancement, while larger countries may have a more diverse array of educational options or different priorities in their educational strategies.

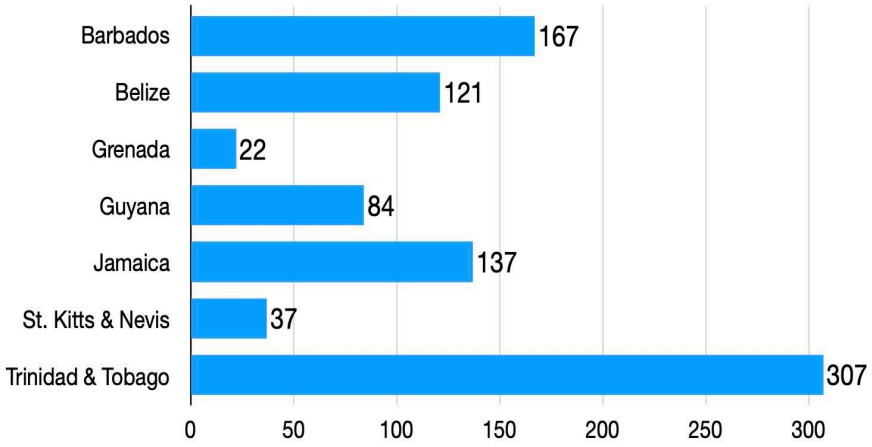


Figure 1. Number of micro-credentials offered by country
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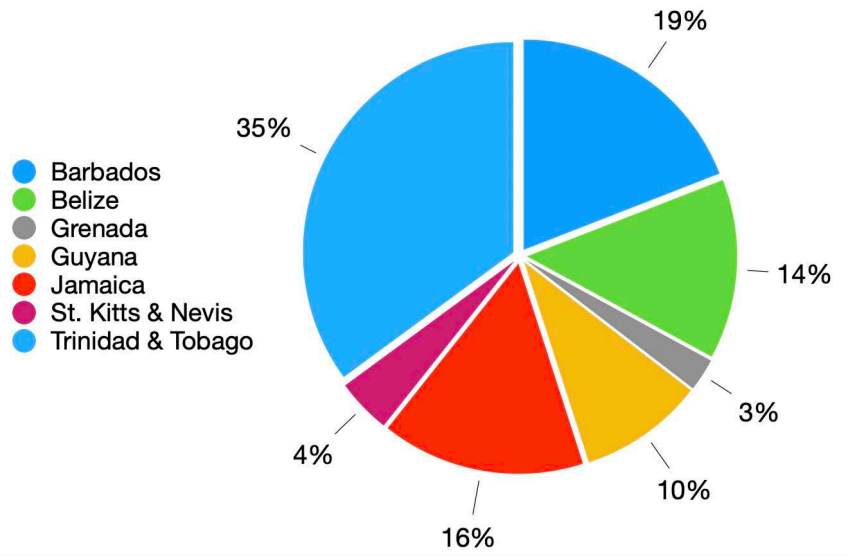


Figure 2. Percentage of micro-credentials offered by country
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The University of the West Indies (UWI)

The participation of the UWI Global Campus was a significant factor in the total number of short courses (255). The University of the West Indies local campuses were also significant contributors (125). See Figure 3. Figure 4 shows the percentage of MCs offered by each type of UWI campus.

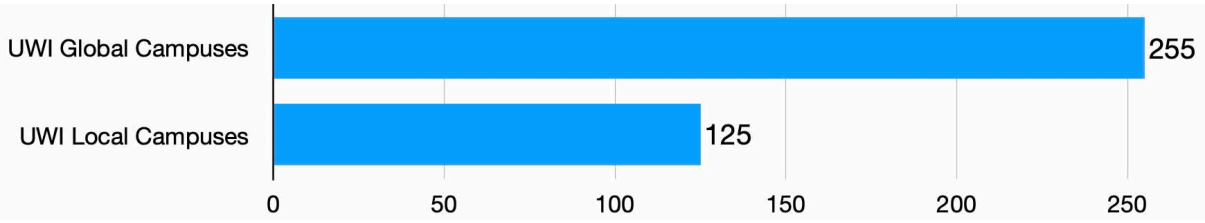


Figure 3. Number of University of the West Indies micro-credentials offered by campuses
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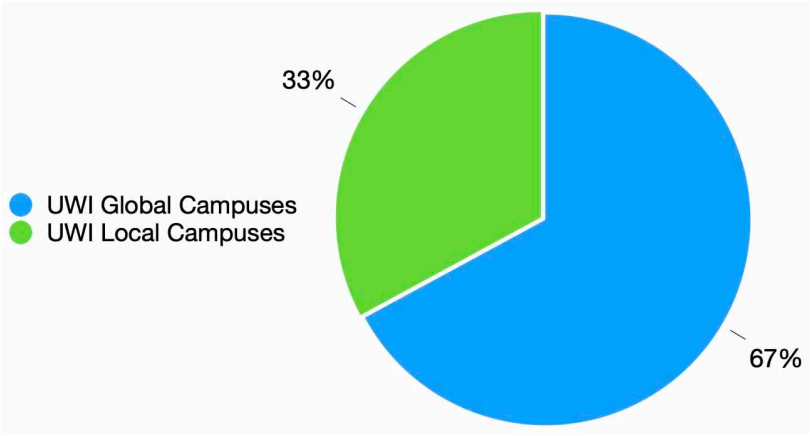


Figure 4. Percentage of micro-credentials offered by University of the West Indies campuses
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UWI and other universities

In comparison to the other universities, UWI's 380 micro-credentials, represented 67% of the university total, which highlights the scalability of online courses. This is compared to only 187 MCs (31%) from all the others. In this study. See Figures 5 and 6. The large number of MCs offered by UWI Global Campus results primarily from its focus on online delivery making the course offerings accessible throughout the Caribbean and further.

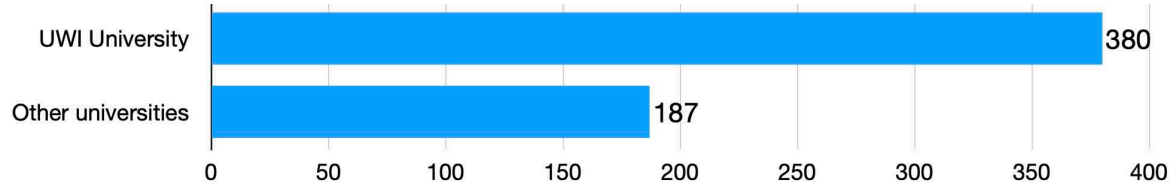


Figure 5. Number of University of the West Indies micro-credentials vs. other universities in the region
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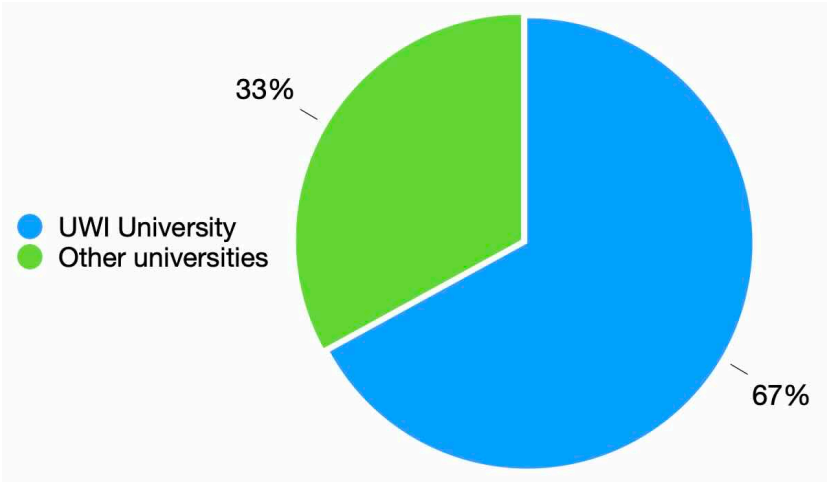


Figure 6. Percentage of UWI micro-credentials compared to other universities in the region
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SUBJECTS OR FIELDS

Please refer to Figures 7 and 8. Despite the wide range of subjects being taught, over one third (38%) or 331 micro-courses (MCs) focused on business-related topics. This trend likely reflects the regional emphasis on meeting job market demands, where entrepreneurs, managers, economists, and marketers are in high demand. The strong focus on business education underscores the significant need for business knowledge and skills in the region.

Additionally, industrial skills training is well-represented, highlighting the importance placed on empowering workers to grow industries and sustain economic development. Together, business and industrial skills courses constituted the majority of the total courses, accounting for 468 out of 875. Technology courses ranked third at 7%, followed by Computers and Education, each at 6%. These skills are in high demand and these numbers could significantly lag behind global trends. Regional decision makers should consider incentivizing high-growth sectors (e.g., green energy, AI) through targeted MC subsidies.

Tourism courses (5%) were notably present, primarily due to the offerings from one school in Trinidad. Culinary courses, also at 5%, were popular and available from a variety of institutions across several countries. The Caribbean's unique cuisine plays a significant role in promoting regional tourism, making these courses economically important throughout the region.

A diverse array of other subjects comprised 2% to 5% of the total courses. Despite being represented in smaller numbers, these courses demonstrate the flexibility of tailoring MCs to suit specific country or business interests and cultural values. See Figure 8 for more details.

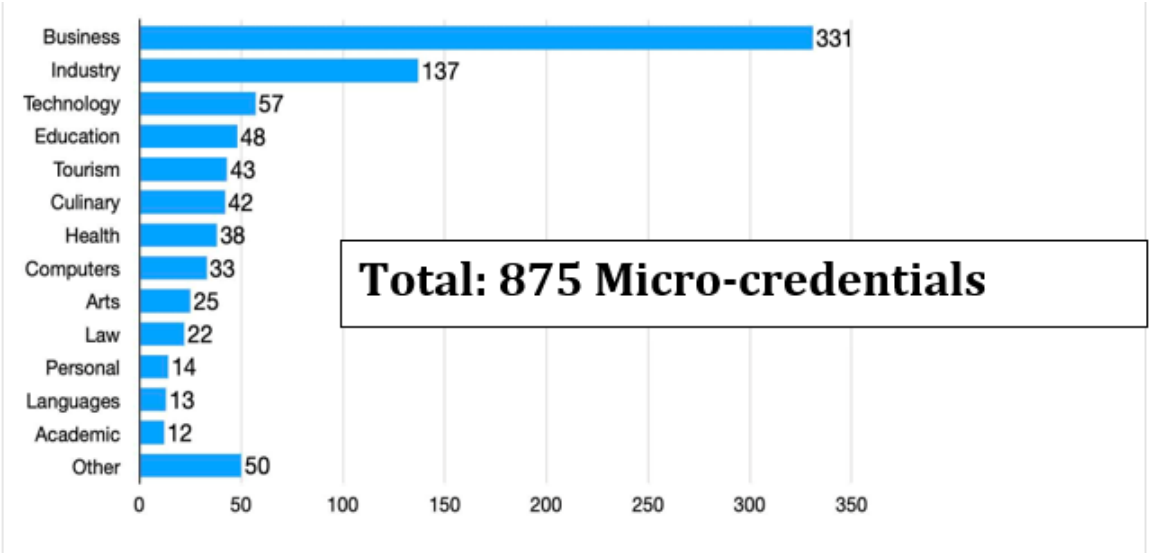


Figure 7. Number of micro-credentials by subject area ©The Author(s)

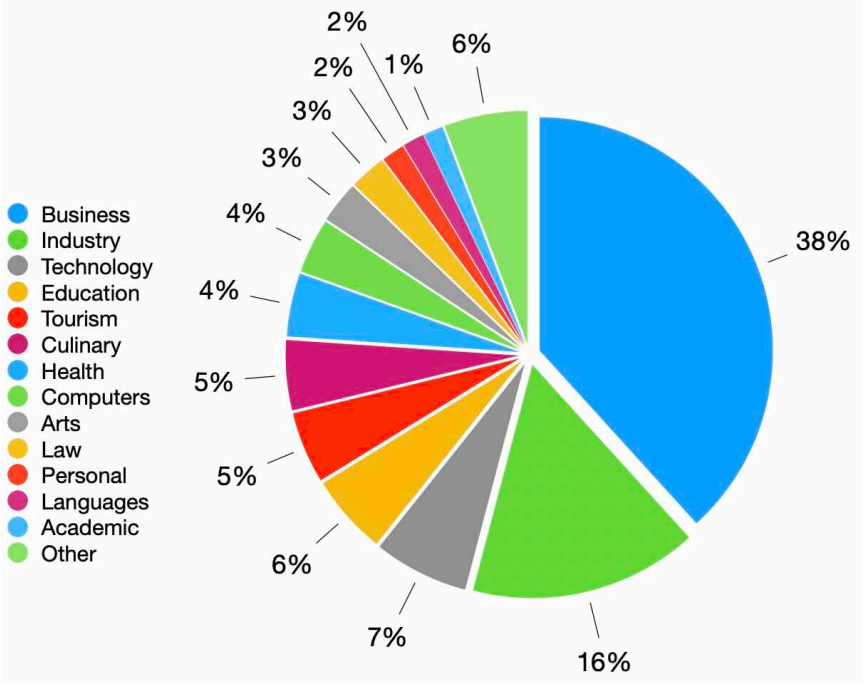


Figure 8. Percentage of micro-credentials by subject area ©The Author(s)

TYPES OF INSTITUTIONS

The data shows that the majority of institutions offering micro-courses (MCs) were universities, accounting for 535 or 60%, which is more than three times the number offered by public colleges (153 or 18%). Private colleges (125) and non-profit private institutions (56) together comprised 20% of the MCs. See Figures 9 and 10. Although a few MCs were offered at the secondary level, they were tailored for an adult clientele in both the public and private sectors.

The predominance of universities in delivering MCs could be attributed to their established infrastructure for education and training, their capacity to offer a wider range of topics, and their ability to award recognized credentials upon completion. This trend suggests a significant interest and demand for such courses at the university level, possibly due to the public's perception of higher

education quality or the alignment of university-offered MCs with professional and academic advancement goals.

Private institutions and NGOs/non-profits also play a crucial role in this educational sector, indicating a diverse ecosystem where multiple types of organizations contribute to lifelong learning and professional development. Their participation suggests there might be niche areas or specialized training that these institutions are better suited to provide. The private sector could alleviate the regional overreliance on universities which risks **excluding industry-aligned trainers**. Support, or even mandates for **cross-sector collaboration** should be considered.

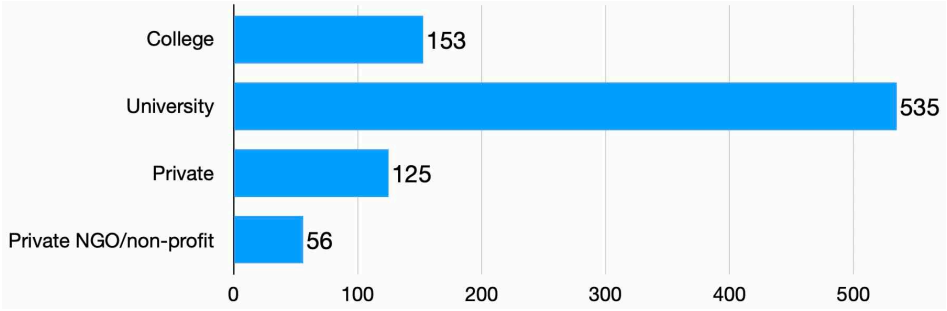


Figure 9. Number of MCs offered by institution type ©The Author(s)

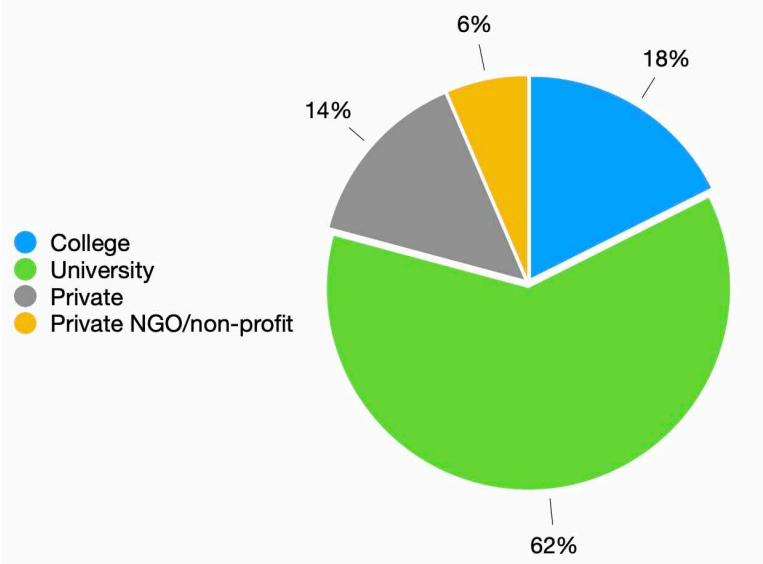


Figure 10. Percentage of MCs offered by institution type ©The Author(s)

MICRO-CREDENTIAL FORMATS

A majority of the MCs (53%) were offered online, with nearly an equivalent number available in a face-to-face format. Only a few courses were provided in hybrid or blended formats. In hybrid courses, some learners attend in person while others participate online. In blended courses, all learners engage in both modalities. Two institutions offered Prior Learning Assessment and Recognition (PLAR), although no data is available for these.

The dominance of online formats aligns well with the predominance of university-level MCs and the UWI Global Campus. This trend is likely due to the accessibility and flexibility of online courses, which are particularly valuable in the Caribbean, with its many islands, dispersed populations, and varying

levels of infrastructure. Online formats are vital for reaching rural and marginalized learners, **yet digital divides** in infrastructure and affordability persist. Nevertheless, face-to-face teaching remains important due to traditional classroom settings and the belief that they offer more person-to-person interactions.

Hybrid and blended formats, despite being less utilized, represent a middle ground that demonstrates the trend toward digital adoption and combines elements of online and face-to-face learning. These courses could well prove to be harbingers of a future in which institutions and learners take greater advantage of the affordances inherent in both online and face-to-face formats.

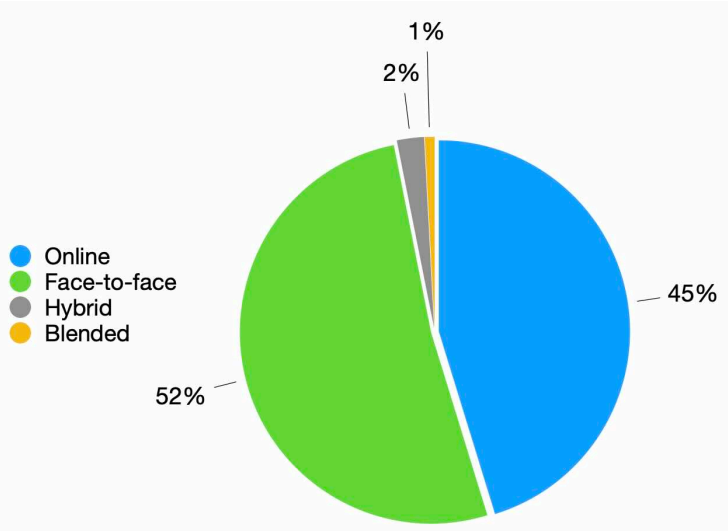


Figure 11. Percentage of MCs by format ©The Author(s)

MICRO-CREDENTIAL COURSE DURATION

The majority of the courses follow the typical one-semester comprehensive course model, with 488 courses representing 56% of the total. This is expected, as universities account for most of the offerings and commonly use the one-semester model, which requires a high level of student commitment. This contrasts with the significantly fewer and shorter courses offered, suggesting that both students and institutions view the one-semester course as the standard.

The second most common duration was the shortest, with 91 courses lasting 1-10 hours, representing 11% of the total. Similarly, courses lasting 11-20 hours also accounted for 11%. These shorter courses indicate a demand for more accessible and flexible MCs, particularly for learners with limited time, such as working professionals.

Fewer courses were offered in the 21–40-hour range (52 courses or 9%), and only 13 MCs exceeded 50 hours (2%). These longer courses are typically highly specialized and expensive. Notably, 99 courses, or 12% of the total, were offered with no information on duration. This could be due to a lack of data tracking by institutions or technical issues. See Figures 12 and 13 for more details.

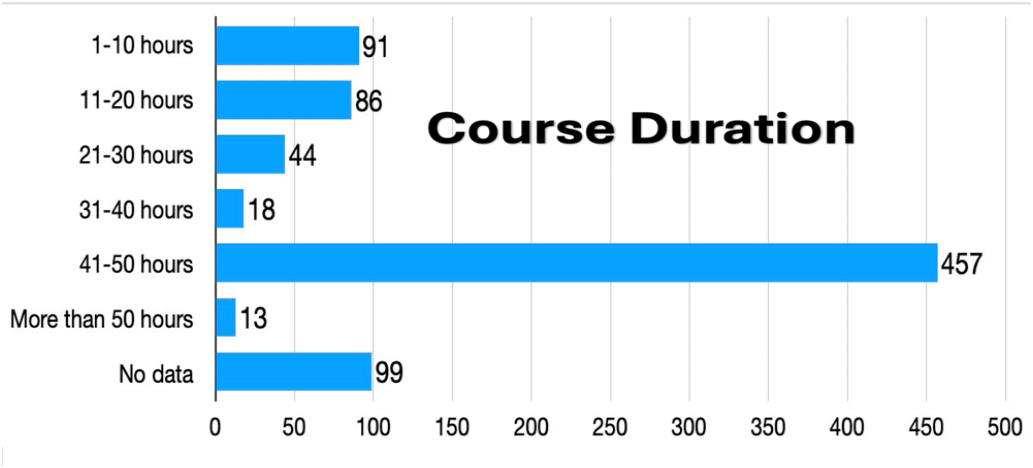


Figure 12. Number of MCs by duration ©The Author(s)

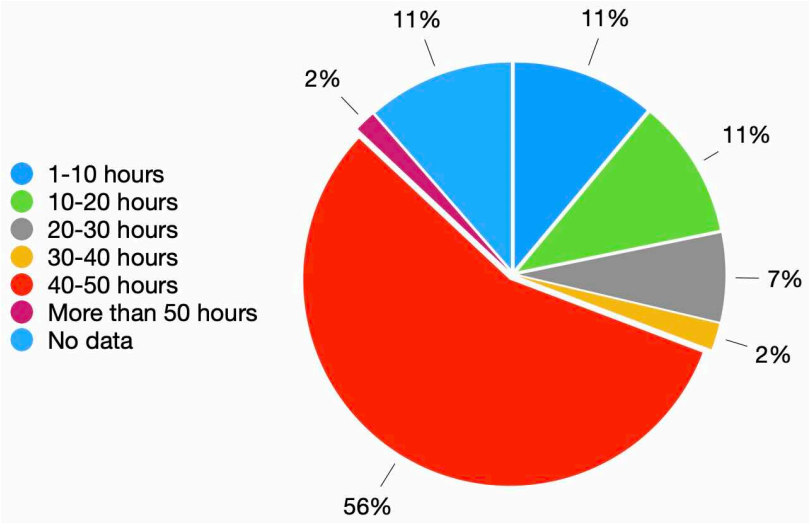


Figure 13. Percentage of MCs by duration ©The Author(s)

MICRO-CREDENTIAL COURSE TYPES

While the majority of MC offerings were described as 'courses' (727), other types were also present, including seminars (71), workshops (22), or a combination of workshop and seminar. The prevalence of MCs described as 'courses' is primarily due to the dominance of universities in offering MCs. This may also indicate a preference among learners for more structured learning formats or for official credentials from recognized institutions.

Workshops and seminars, on the other hand, are typically designed to address specific needs and are delivered in a timely fashion. While courses may be more aligned with long-term career development, workshops and seminars often focus on immediate skills enhancement or knowledge updates. There may be an opportunity for institutions to expand their offerings of shorter sessions in specific areas of need for practical skills, as expressed by companies and organizations in the region. See Figure 14 for more details.

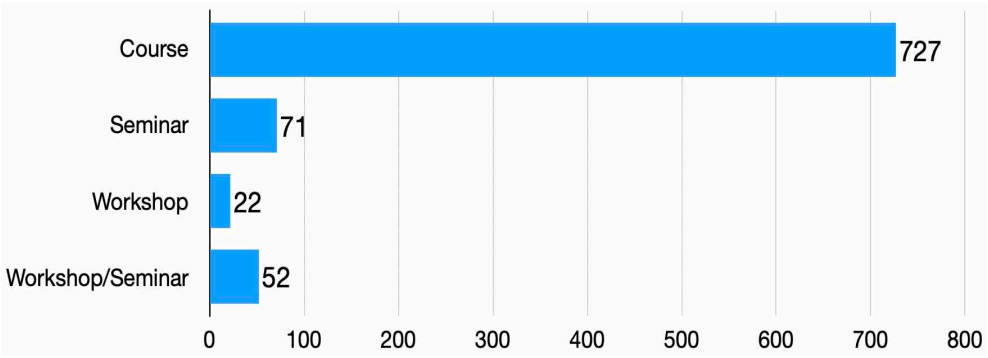


Figure 14. Number of MCs by course delivery type ©The Author(s)

TUITION OR FEES

The websites of most institutions (502) did not provide information on fees (57%). This indicates that a significant number of courses lack publicly available information regarding their costs. The absence of listed tuition fees reveals systemic equity gaps. This poses a challenge for potential students seeking to make informed decisions about their education, disproportionately affecting low-income learners. The lack of cost information online could potentially be due to institutions' budgets not being finalized, rather than a lack of transparency. However, this absence of information could prove to be a barrier to access, as cost is a significant factor for most people when considering further education or training. Institutions should strive to be more transparent by providing comprehensive fee information for their MCs. This would not only improve transparency but also assist prospective students in their decision-making. See Figures 15 and 16. A Caribbean-wide transparency framework for student fees could help in addressing regional equity gaps.

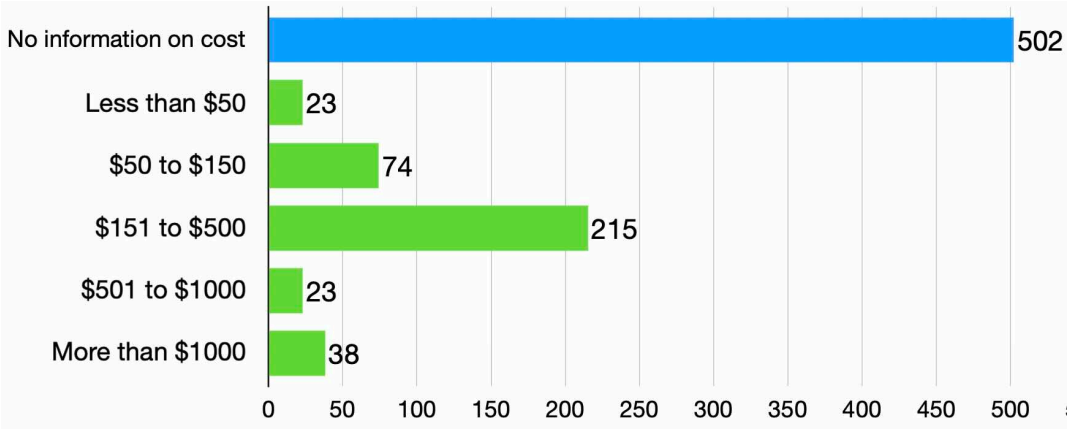


Figure 15. Number of micro- courses according to tuition fees. (In US$ equivalents) ©The Author(s)

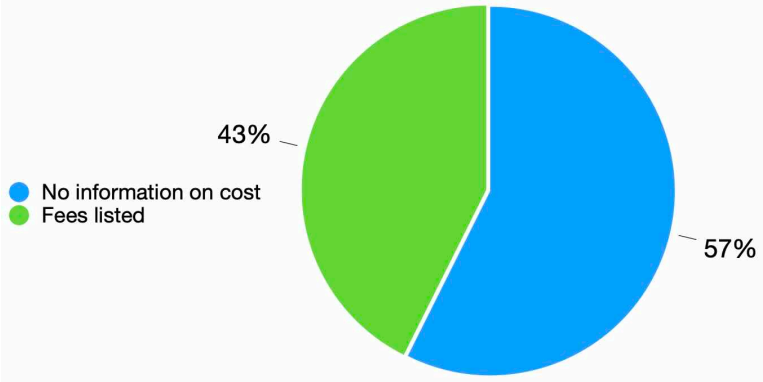


Figure 16. Percentage of MCs: Fees listed vs no information ©The Author(s)

Among the MCs that displayed fees (43%), the fees are presented in US dollar equivalents due to the different currencies involved. More than half of these institutions charged fees ranging between US$151 and US$500, which aligns reasonably well with the data on course duration (56%), reflecting the cost of a one-semester course. The higher-cost courses are predominantly face-to-face, with some hybrid and online options available in technology-related fields. In contrast, the lower-cost courses consist of a mix of face-to-face and online courses of short duration (hours or a few days). Secondary level courses for adults in Guyana are available in both face-to-face and online formats, costing US$24 or less.

Excluding the no-cost MCs, the remaining data suggests that the majority of MCs offered (215 or 58%) fall into the mid-range price bracket ($151 to $500), indicating that institutions may be positioning these MCs as valuable yet still widely accessible. The next most significant category is the $50 to $150 range (74 or 20%), likely representing entry-level or introductory courses.

Notably, the combined percentage of courses priced above $500 (6% + 10% = 16%) is almost as high as the $50 to $150 range, indicating a substantial market for premium, potentially more specialized, or advanced courses. MCs priced at less than $50 constitute the smallest percentage, suggesting that very low-cost courses are less common. This scarcity could be due to the costs associated with developing and delivering these courses not being covered by such low fees.

Overall, the region offers a range of options from more affordable to premium offerings, potentially reflecting the diversity of course content, duration, and audiences. See Figures 17 and 18 for more details.

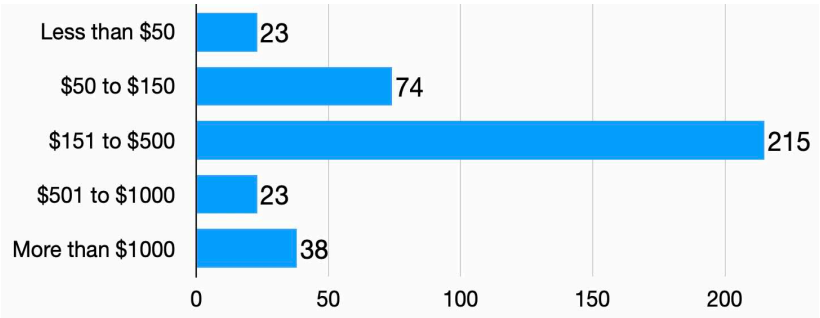


Figure 17. Number of MCs by tuition fees (no information MCs removed) ©The Author(s)

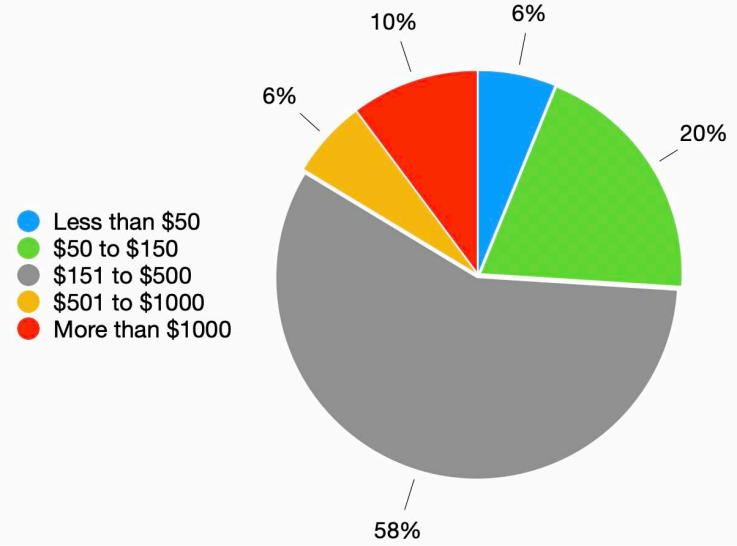


Figure 18. Percentage of MCs by tuition fees (no information MCs removed) ©The Author(s)

The statistics in Table 1 below provide a comprehensive view of the MCs fee structure across different institution types in the spreadsheet. Universities have the highest average fee, followed by colleges, private institutions, and private NGOs, which have the lowest. The Median fee is the midpoint in the fee distribution. The Mode fee indicates the most common institutional fee charged.

Table 1. A summary of the mean, median, and mode of the fees (in US$ equivalents) for each type of institution

Institution Type	Mean Fee	Median Fee	Mode Fee
College	$324.27	$272.50	$224.00
Private	$145.69	$168.75	$168.75
Private NGO	$21.79	$10.00	$10.00
University	$486.32	$300.00	$175.00

This is one time data from March 2024, which references the fee structures across different institution types. There is a positive correlation between course duration and cost for the majority of MCs, with exception for secondary level (low fees) and some high value technology or business courses (high fees). No student data is included, so there can be no information on enrolments, retention, sex, age, educational levels and other factors influencing the success for students.

CONCLUSION

This study illuminates the evolving role of micro-credentials (MCs) in the Caribbean as a strategic response to workforce development and economic challenges. The findings reveal a dynamic landscape where smaller nations like Trinidad and Tobago, Barbados, and Belize prioritize MCs to enhance competitiveness, despite Jamaica's larger population lagging in offerings. The dominance of the University of the West Indies (UWI), particularly its Global Campus, underscores the critical role of universities in delivering accessible, region-wide education through online formats. The strong

emphasis on business and industrial skills aligns with the Caribbean's economic priorities, while niche areas like culinary and tourism reflect cultural and sectoral strengths.

However, challenges persist. Fee transparency remains a significant barrier, with 57% of institutions failing to disclose costs, potentially excluding learners from marginalized backgrounds. Additionally, the overreliance on universities risks limiting diversity in course providers and pedagogical approaches, despite contributions from private and non-profit institutions. The absence of student data—enrolments, demographics, or outcomes—further restricts insights into MC efficacy and equitable access.

Moving forward, Caribbean stakeholders must foster cross-sector collaboration to diversify offerings, improve cost transparency, and integrate MCs into national education strategies. Future research should explore learner experiences, labour market impacts, and innovative delivery models to ensure MCs fulfil their potential as tools for inclusive growth. By addressing these gaps, the Caribbean can leverage MCs not only to meet immediate skill demands but also to build resilient, adaptive economies in an era of rapid global change.

Micro-credentials can be used to spearhead innovation and change throughout the region. Actions to promote this include adopting a Caribbean Credit Transfer System ensuring portability among providers and employers. Private-sector MC partnerships in technical and vocational training could be funded to ensure the availability of a modern trained workforce. Public fee disclosure along with data on employment rates post-completion would also increase accessibility and acceptability of MCs. Universal access to broadband and affordable devices for rural learners would substantially increase enrolments.

The Caribbean's MC landscape exemplifies how online learning can democratize education in geographically fragmented regions—yet also reveals how policy inertia can exacerbate inequities. By addressing institutional monopolies, fee transparency, and digital access, Caribbean nations can harness MCs not just for workforce readiness, but for inclusive economic transformation. Future research must track learner outcomes and labour market impacts to validate MC efficacy.

Summary

This study provides a detailed analysis of 875 micro-credentials (MCs) across seven Caribbean nations, offering insights into distribution, subject areas, institutional providers, and fee structures. The paper highlights unexpected trends, such as Trinidad and Tobago leading in MC offerings despite Jamaica's larger population, and the dominance of the University of the West Indies (UWI) in MC provision. These findings challenge assumptions and underscore the strategic prioritization of MCs in smaller nations. The focus on business-related (38%) and industrial skills (17%) MCs reflects the Caribbean's economic needs, while niche areas like culinary and tourism (5% each) highlight cultural and sectoral relevance. This alignment demonstrates the potential of MCs to address workforce demands. There is a need for collaborative strategies to improve fee transparency and diversify offerings, providing actionable recommendations for policymakers and institutions.

Further Research

There is a significant lack of data on enrolments, demographics, retention, or learner outcomes. Without this, educators cannot properly assess the efficacy, accessibility, or equity of MCs, limiting

institutions in implementing practical initiatives. This investigation critiques the lack of fee transparency (57% of MCs), but there is a need for further research to explore underlying reasons (e.g., institutional barriers, policy gaps) that can empower institutions to propose specific solutions beyond general calls for improvement. The dominance of UWI (67% of university MCs) is noted, but more research is required that critically examines whether this centralization might be stifling innovation or excluding non-university providers (e.g., vocational trainers) who might better address local skill gaps. Further research should investigate challenges like digital divides in the Caribbean, which exclude rural or low-income learners despite the flexibility of online MCs. Caribbean findings could be contextualized within broader debates globally (e.g., credential recognition, employer perceptions). A comparative analysis with other developing regions could reveal important trends transferable best practices, unique challenges or common problems. A longitudinal analysis showing trends over time (e.g., growth in MC offerings, shifts in subject areas) could provide richer insights into the evolution of MCs in the region supporting effective adaptation to the changing economic and educational landscape

The paper offers a valuable foundation for understanding micro-credential trends in the Caribbean, particularly in highlighting the strategic role of smaller nations and University of the West Indies.

AUTHOR NOTES

This paper is based on a report for the Commonwealth of Learning and the Caribbean Examinations Council. Available at http://hdl.handle.net/11599/5632

The authors acknowledge the use of large language models: ChatGPT v.4, developed by OpenAI and DeepSeek. They reviewed and edited the content as necessary and take full responsibility for it.

30th International Council for Open and Distance Education World Conference 2025

Ako: Rethinking Teacher Professional Learning in Education for Sustainability

Fariba Mostafa[1]

[1]University of Otago

ABSTRACT

This paper explores how the principle of Ako, a reciprocal, relational model of learning rooted in Māori pedagogy, can be applied to enhance teacher professional learning (TPL) in Education for Sustainability (EfS). It presents findings from a qualitative study in which secondary school teachers in Aotearoa, New Zealand, connected with university-based experts through a closed social media community. The co-constructed learning community supported collaboration, resource sharing, and knowledge exchange, blending flexibility with structured expert guidance.

Central to the initiative was the role of university-based experts, who acted not as instructors but as relational facilitators. They modelled reciprocal engagement and grounding the community in trusted disciplinary knowledge. Integrating Ako into the design motivated teacher participation and engagement, addressing common challenges of fragmentation and low trust in social media-based teacher professional learning.

This paper adds to international discussions on accessible, flexible professional development by offering practical insights for teachers, researchers, and policymakers. It advocates embedding structured, culturally responsive, and digitally facilitated teacher professional learning within formal education systems so that EfS is treated not as an 'add-on' but as a core, lifelong element of teacher growth.

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INTRODUCTION

The urgency of climate change, ecological degradation, and social inequities has increased the emphasis on integrating sustainability into education worldwide (UNESCO, 2021). In line with the

international approach, the New Zealand Curriculum (NZC) positions sustainability as a future-focused theme and key competency in education (Ministry of Education, 2007). To support this, the Ministry has provided a non-mandatory framework for integrating Education for Sustainability (EfS) across the curriculum, placing teachers at the centre of implementation (Ministry of Education, 2016), with teachers expected to embed EfS directly into their teaching (Bolstad et al., 2015). Secondary teachers are especially well-placed to influence students during a formative stage of identity and citizenship development (Taylor et al., 2019). However, they often face significant barriers, including insufficient interdisciplinary support, limited time, and a lack of sustained professional learning opportunities (Bolstad et al., 2015; Eames et al., 2010).

Research shows that teachers who engage in professional learning are more confident and more likely to integrate sustainability themes across the curriculum, underscoring the critical role of teacher professional learning in EfS (Eames & Barker, 2011). Effective EfS teaching requires access to disciplinary expertise and collaborative support (Mostafa, 2021; Ravindranath, 2007; Timperley et al., 2007). Supporting teachers engaged in EfS requires the establishment of communities of learning that extend beyond individual classrooms (Saari et al., 2024). Participation in these communities empowered teachers through ongoing, collective learning processes. This underscores the importance of designing professional learning opportunities that are relational, collaborative, and grounded in real-world contexts. While prior studies highlight the potential of learning communities to empower teachers, there remains limited research into how expert-facilitated, culturally responsive online spaces can sustain teacher learning in EfS. This gap is especially pressing in contexts like Aotearoa, where culturally grounded principles such as Ako may offer meaningful frameworks for relational engagement.

Building on this foundation, the current study explores the implementation of a university-facilitated online learning community informed by Ako. The initiative connected secondary school teachers in Aotearoa, New Zealand, with academic experts through a closed social media group. Teachers engaged with the community by collaborating and learning with and from each other, sharing materials, and accessing curated teaching resources within a trust-based, relational network. By situating this initiative within both international and New Zealand scholarship, the study shows how university expert moderation and culturally responsive design can enhance teacher engagement with social media for EfS learning. It further illustrates how such approaches support secondary teachers in integrating sustainability into the curriculum.

LITERATURE REVIEW

The rise of digital and hybrid professional learning models through social media has enabled new opportunities for ongoing, flexible, and collaborative engagement (López-Torres et al., 2022). Social media platforms allow geographically dispersed and professionally isolated teachers to connect with peers and academic experts, share resources, and co-create knowledge (Greenhow et al., 2020; Greenhow et al., 2023). A systematic review of 53 empirical studies (2018–2023) shows that social media contributes to multiple dimensions of teacher development. Around 40% of the studies identified social media as central to professional growth, particularly in facilitating access to resources, pedagogical updates, and peer exchange. Research also highlights the role of social media in providing emotional support, enabling teachers to connect and build broader professional communities (Mercado & Shin, 2024). These international findings resonate with limited research from New

Zealand, where social media has been shown to offer a flexible, collaborative space for teacher professional learning in EfS, particularly for teachers in rural and remote areas who often lack local support (Mostafa, 2021).

While social media offers increasing possibilities for teacher professional learning (TPL), the literature also highlights several challenges associated with its use. The vast inflow of information can become overwhelming and result in time-intensive work (Carpenter & Harvey, 2019). Learning through social media often results in fragmented and superficial engagement due to uncertainty about the reliability of shared resources and the credibility of contributors (Carpenter & Harvey, 2019, 2020). Some studies have found that teachers associate social media with entertainment rather than learning, reducing its perceived value in teacher professional learning (López-Torres et al., 2022). Without clear moderation or control, social media can circulate low-quality or misleading resources, leading some teachers to view social media-based learning as superficial and unproductive (Davis, 2015; Mostafa & Eames, 2025).

Concerns about data privacy and the perceived superficiality of social media interactions further limit teachers' willingness to fully participate in professional learning on social media (Carpenter & Harvey, 2020; López-Torres et al., 2022). Teachers have also expressed worries about data exposure and a tendency toward self-censorship in open platforms (Greenhow et al., 2018; Marín et al., 2022). Concerns about both the credibility of experts on social media and the accuracy of shared content are especially relevant in EfS professional learning, where topics are often complex and require understanding from multiple perspectives (Parry & Metzger, 2023). This may lead to a lack of trust, lower participation, and less willingness to share ideas or contribute to collaborative learning (Carpenter & Harvey, 2020). Beyond these common concerns, literature also points to the challenge of aligning digital technology use with the practical, sensory, and hands-on nature of EfS pedagogy (Aguayo & Eames, 2023). Teachers report spending considerable time filtering through irrelevant or low-quality posts to find credible and relevant content, which reinforces the perception that social media-based learning is an added burden rather than meaningful professional development in EfS (Mostafa & Eames, 2025).

In addition to these challenges, structural barriers such as time scarcity and workload pressures significantly shape teachers' capacity to engage meaningfully with professional learning (Timperley et al., 2007). Research emphasises that even when PL environments are well-designed and flexible, participation often competes with teachers' existing responsibilities, requiring personal time and strong intrinsic motivation (Carpenter & Harvey, 2020). Without protected time, formal recognition, or leadership support, involvement in social media–based teacher professional learning can be difficult to sustain. This is especially pertinent in non-core subjects like EfS, where professional learning is often deprioritised in favour of core content areas (Mostafa & Eames, 2025). These limitations indicate that more than just platform access is required to engage in teacher professional learning in EfS.

While many teachers are reluctant to engage in professional learning through social media due to perceived challenges, research shows that their engagement increases when the learning network is trustworthy and professionally valuable (Greenhow et al., 2018; Trust et al., 2016). Trust et al. (2016) emphasise that professional learning networks that are focused (hashtag-driven), or moderated by experts, encourage sustained interaction, particularly when members perceive the group as a credible and supportive space. Teachers are also more willing to invest personal time in professional learning

when they are part of closed, supportive, and expert-moderated communities that provide relevant content, emotional safety, and a sense of belonging (Carpenter & Krutka, 2015). Recent research underscores the importance of moderation and facilitation, showing that online networks depend on visible and trusted members, such as coordinators, gatekeepers, and representatives, who guide interactions, broker relationships, and sustain knowledge exchange (Mercado & Shin, 2024). These findings align with calls for relationally structured, curated, and participatory models of professional learning, where expert moderation ensures depth, credibility, and relevance (Caena & Vuorikari, 2022). Without protected time, formal recognition, or leadership support, involvement in social media-based teacher professional learning can be difficult to sustain(Timperley et al., 2007).

Academic experts can bridge the gap between research and practice, providing teachers with disciplinary expertise and access to global sustainability frameworks (Timperley et al., 2007). Literature highlights the value of university-affiliated experts in sustaining engagement, enhancing credibility, and fostering meaningful learning and suggests that collaborative models involving universities can play a transformative role in strengthening teacher engagement with EfS and supporting systemic integration of sustainability across the curriculum (Shephard et al., 2024). For example, Philipsen et al. (2019), in a meta-aggregative review of online and blended teacher professional learning, found that access to credible pedagogical and technical support, which is often provided by higher education professionals, significantly improves learning outcomes and teacher satisfaction. Collaborative partnerships between universities and schools have also been shown to help teachers critically explore place-based sustainability education, strengthen pedagogical confidence, and co-construct knowledge through expert support (Taylor et al., 2019). These collaborations enrich professional learning by integrating theory with practice and embedding the interdisciplinary and enquiry-based perspectives central to EfS pedagogy (Warr Pedersen, 2017). Importantly, this role can also extend into digital spaces. The involvement of university experts in social media-based professional learning has been shown to enhance the credibility, relevance, and perceived value of these platforms, helping to overcome common barriers such as trust, information overload, and fragmented engagement (Trust, 2012; Trust et al., 2016).

Within Aotearoa New Zealand, the Māori principle of Ako offers a culturally grounded framework for guiding such collaborative professional learning (Bishop & Berryman, 2010). Ako emphasises reciprocity, care, and community-embedded knowledge exchange, positioning both teachers and experts as co-learners in a shared inquiry process. In digital contexts, where professional learning often suffers from individualism and fragmentation (Carpenter & Harvey, 2020), Ako offers a valuable counterbalance that prioritises relational trust and collective meaning-making. Evidence from Kāhui Ako initiatives demonstrates that effective learning communities depend on leadership practices that broker expertise, build trust, and foster collaborative inquiry (Constantinides & Eleftheriadou, 2023). These principles are highly relevant to online professional learning environments, where the presence of trusted academic experts can help structure participation, enhance credibility, and encourage sustained teacher engagement.

Despite growing interest in the use of social media for teacher professional learning (TPL), there remains limited research on how university-based experts can act as trusted epistemic partners in these digital spaces, particularly when such engagement is shaped by culturally grounded frameworks like Ako. This study addresses that gap by exploring the following research question:

How can expert-facilitated social media communities, informed by the principle of Ako, support secondary teachers' professional learning in Education for Sustainability?

METHODOLOGY

This paper re-analyses interview data from Phase Three of a broader qualitative study that explored teachers' experiences of using social media for professional learning in Education for Sustainability (EfS) in Aotearoa New Zealand. Situated within an interpretivist paradigm, the study employed qualitative methods in its design, data collection, and analysis to capture the complexity and diversity of teacher engagement in professional learning via social media. Ethical approval was granted by the University of Waikato Human Research Ethics Committee, and all participants provided informed consent. Participation was voluntary, and anonymity was protected through the use of pseudonyms and careful handling of potentially identifying information.

The research was conducted in three sequential phases, each informing the next. This paper focuses specifically on Phase Three, which involved the co-construction of a closed, expert-facilitated online learning community designed to support teacher professional learning in EfS. The community was designed to connect secondary school teachers from across Aotearoa New Zealand with university-based EfS experts, offering both synchronous and asynchronous support. Participation focused on the EfS Achievement Standards, and only teachers engaged with these standards at the secondary level were included in the community. The community was hosted on a closed social media group and involved eight volunteer secondary school teachers, of whom four actively participated and consented to the use of their data. The remaining teachers, while members of the community, did not actively contribute and are not considered participants in this study. Four participants — Helen, Blake, Juno, and Bruce — engaged in the EfS community, each bringing distinct perspectives and experiences. Together, their accounts provide a multifaceted picture of how teachers negotiated opportunities and challenges within the expert-facilitated community.

The community operated during a single school term, offering both synchronous and asynchronous professional learning activities. Five webinars were held over the study period, led by EfS university-based experts, and focused primarily on the EfS Achievement Standards. These synchronous sessions aimed to foster engagement by replicating the sense of connection found in face-to-face professional development. They provided opportunities for teachers to interact with experts, pose questions, access shared resources, and engage in peer discussion. The asynchronous component of the community was organised into categories such as Introductions, Questions and Answers, Discussions, Events, Links and Resources, and Achievement Standards (Levels 2 and 3). These were designed to help teachers navigate content efficiently and build trust through ongoing interaction. The "Introductions" category was particularly aimed at establishing a relational foundation among members, which aligned with the principle of Ako. However, an analysis of platform activity showed that teachers did not always post content under the expected categories, showing that teachers engaged in more fluid ways.

Consistent with the study's commitment to fostering a collaborative, relational, and expert-informed learning environment, the community was centred around a university-based expert (the second author) who was well known and trusted by participating teachers. He acted as facilitator, hosting webinars that provided opportunities for synchronous discussion and Q&A. In addition to facilitating live sessions, he responded to participants' questions asynchronously and modelled dialogic and reflective practice throughout the platform. A total of five webinars were held; each focused on specific

aspects of the EfS Achievement Standards. Sessions were shaped by participant interests and combined short presentations with open question-and-answer segments, fostering two-way, synchronous communication between facilitators and teachers. Webinars were scheduled at 7:00 pm (19:00) to accommodate teachers' work commitments and typically lasted for one hour.

A Māori advisor supported the research team by providing cultural insights into te ao Māori perspectives on sustainability. While she did not engage directly in online discussions, her guidance helped ensure cultural relevance and sensitivity in the community's design. The first author served as the administrator of the online learning community, coordinating logistics, organising webinars, sourcing and sharing relevant resources, initiating discussion threads, curating content, and supporting ongoing participation by modelling collaboration between teachers and experts. One author acted as expert facilitator and researcher, while the other served as administrator and researcher. Acknowledging these dual roles, we employed reflexive practices to mitigate potential bias, including memo-writing during data analysis and peer debriefing between authors.

The analysis focused on interviews with teachers who participated in the online learning community, using Ako as a theoretical lens. Being a Māori pedagogical principle that emphasises reciprocity, relational engagement, and the co-construction of knowledge, Ako guided the interpretation of how culturally grounded, expert-supported digital learning can support professional learning in EfS. This lens highlighted how values such as trust, reciprocity, and collective inquiry shaped teachers' experiences of the community. Thematic analysis followed Braun and Clarke (2006) six-phase framework, beginning with familiarisation and proceeding through initial coding, theme development, and refinement. Coding was conducted inductively, while interpretation was guided by Ako as a sensitising concept. Data analysis was supported with NVivo to manage and organise codes.

The next section presents an integrated analysis of interview data from teachers who participated in a closed, expert-facilitated online learning community for professional learning in EfS. Drawing on the Māori principle of Ako as a theoretical lens, the analysis explores how the design features of the community such as expert facilitation, relational engagement, and curricular relevance, shaped teachers' experiences and addressed known challenges in social media-based professional learning. The findings are discussed thematically and interpreted in relation to existing literature.

FINDINGS AND DISCUSSON

Expert Trust

A dominant theme across the interviews was the importance of access to trusted expertise. Participants highlighted the value of direct interaction with a university-based expert. Blake explained: "*Access to people like [the expert] was hugely valuable and that was part of the reason that I joined the community*" (Blake, interview). For all four participants, the presence of the expert supported deeper engagement with the curriculum, built confidence in teaching, and reduced feelings of isolation. Juno reflected that the most valuable aspect of participation was "*the opportunity to have [the expert] answer questions if we had any*" (Juno, interview). Participants agreed that the credibility of expert responses increased their willingness to engage and strengthened their sense of support in professional learning. This directly addresses a major limitation of social media-based professional learning identified in the literature: the lack of trust in user-generated content and the absence of authoritative moderation (Carpenter & Harvey, 2019, 2020). As Philipsen et al. (2019) note, online

teacher learning networks are strengthened when trusted experts, such as university-affiliated facilitators, are active and credible members of the community. This study supports that finding in an EfS context.

Participants did not describe the expert as a distant authority but as someone approachable and responsive. Helen identified the most satisfying aspect of her involvement as "*knowing that I had a means by which I could ask questions and find information*". She explained:

> *There is a lack of information due to the nature of EfS Standards. Because it is inquiry-based learning, you do not know which way you could go. In the absence of Ministry [of Education] support, you can easily get to an expert who answers the questions through the EfS Community.* (Helen, interview).

She added: "*The positives for me were being able to communicate with the expert and meeting other people… to share ideas and to share experience. I found it very valuable*." This reflects broader research showing that teachers are more likely to engage in professional learning when facilitators are accessible, trustworthy, and relationally embedded (Trust et al., 2016). Consistent with Ako's emphasis on reciprocity and shared knowledge construction, the EfS community was experienced as a collaborative exchange, a central element of Māori-informed pedagogy (Bishop & Berryman, 2010).

Collaboration and Belonging

In contrast to the individualism often associated with digital professional learning, this community was strongly relational, reflecting Ako's emphasis on shared inquiry and mutual responsibility. Teachers described feeling connected, supported, and recognised within the space. Blake explained: "*It was definitely beneficial in terms of just meeting some other people and having a discussion around the big picture of the EfS.*" He added: "*Our webinars were more interactive and more conversations… and that was amazing*." Helen also emphasised the relational value of webinars, particularly in the absence of opportunities to meet colleagues face-to-face:

> *We are teaching very much in isolation… The webinars were great, because you feel that you have met a person. Meeting somebody (EfS teachers or experts) in person is obviously ideal but webinars were good, second best if you like.* (Helen, interview).

She further endorsed EfS as a method of collaboration with both teachers and experts. Juno highlighted a similar benefit: "*It was an opportunity to have a face-to-face discussion with EfS experts. When teachers have many questions, it makes more sense to ask directly through a webinar rather than sending emails*" (Juno, interview). These reflections point to a learning experience that was not transactional but relational, aligning with previous studies that emphasise the role of emotional connection and belonging in sustaining teacher engagement in professional learning (Bishop & Berryman, 2010; Mostafa & Eames, 2025). As Trust et al. (2016) observe, professional learning networks thrive when participants exchange expertise and support one another's goals. This study affirms that finding in the context of EfS.

Content Relevance

Another key theme was the alignment between community content and teachers' classroom needs, particularly in relation to the EfS Achievement Standards. Participants consistently noted that the community provided targeted, relevant support, which contrasts with the unfocused discussions that often characterise social media–based learning (Greenhow et al., 2020). Helen observed: "*It was good to have a webinar on Achievement Standards 2.1 and 3.1—those were exactly what I needed help with*." Similarly, Juno remarked: "*I found shared resources regarding Standards 2.1 and 3.1 quite useful*." This targeted focus gave the community a sense of purpose and distinguished it from broader online groups.

Additional accounts reinforced this emphasis on relevance. Helen explained: "*The things I have found really useful — and I used them — were the spreadsheet which includes teachers' names across a region and the EfS Standards that they were teachin*g" (Helen, interview 2). Blake highlighted the same point: "*If the topic is so broad and if that is not relevant to you, you are not going to, sort of, sit in it*" (Blake, interview 2). Juno also acknowledged limits of relevance, noting: "*The first webinar was mainly general and it suited me, the second one was specific to the assessment. As I am not doing the assessment, it was not useful for me*" (Juno, interview 2). Taken together, these findings demonstrate that teachers valued the EfS community when activities were closely aligned with immediate professional needs. They also support Caena and Vuorikari's (2022) assertion that focused, curated professional learning spaces are more effective — particularly when guided by experts able to respond in real time. Within EfS, which is both complex and evolving, teachers clearly placed high value on focused, collaborative engagement.

Time Pressures

Despite being designed for flexibility, with both synchronous and asynchronous modes, the community was difficult for participants to engage in regularly. The reality of time scarcity — particularly for a non-core subject like EfS — meant participation often depended on lighter workload periods. Teachers described fitting professional learning around personal commitments, often outside working hours. Blake explained: "*During working hours, I don't have a big period of time that I am not uninterrupted, so in the evenings I tend to have that when my kids are in bed*" (interview 2). Helen similarly reflected:

> *The community itself was very positive and very useful. However, it did involve time and that is something that I do not have a lot of. So, it was hard fitting it in to be part of all activities… But then again, I was determined to be involved and that was the reason I engaged in the EfS Community*. (Helen, interview 2)

These findings highlight a structural issue in teacher professional learning: participation often relies on teachers' personal time, which happens to commonly be late evenings or after family duties and daily errands. While determination enabled some to engage, this reliance on discretionary hours made involvement uneven and, at times, unsustainable. This echoes wider research showing that professional learning remains limited without protected time and leadership support (Mostafa & Eames, 2025; Timperley et al., 2007).

CONCLUSION

This study demonstrates how Ako offers a culturally grounded framework for understanding teacher professional learning in EfS, showing that relational engagement is central to meaningful teacher growth. It reinforces evidence that professional learning in EfS is most effective when it is culturally responsive, relationally structured, and supported by trusted expertise. Teachers valued the university expert not only for disciplinary knowledge but also for the way that knowledge was shared — with humility, reciprocity, and care. The findings also show that university–school collaboration does not need to be complex; even simple connections between teachers and experts through social media can provide meaningful support, encouraging teachers to integrate EfS more confidently into their practice.

At the same time, the initiative could not fully overcome systemic workload constraints that limited teacher participation. Engagement remained dependent on teachers' personal time and motivation. Future EfS professional learning initiatives should therefore actively involve school leadership and policymakers to ensure that teachers are allocated protected time. Embedding professional learning within teachers' formal responsibilities — rather than relying on after-hours effort — will be critical for sustaining engagement. Ultimately, integrating EfS as a legitimate, structurally supported component of the secondary curriculum will be essential for advancing both educational practice and sustainability outcomes.

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30th International Council for Open and Distance Education World Conference 2025

Books and Babies: Pregnant People and New Mothers' Experiences of Online Distance Education

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ABSTRACT

The flexibility of online learning increases the accessibility of higher education to women who are combining their studies with having or growing a family, however, this does not mean their studies will be straightforward. Indeed, the learning and support needs of these students are poorly understood. The aim of this mixed methods study was to better understand the experiences of these students, their challenges and their support needs. Nine qualitative interviews were undertaken with students from a large online distance education institution in the United Kingdom. A thematic analysis of interview data informed the design of a quantitative survey. Key findings from 156 survey responses supported the qualitative themes of which there were four: 1) motivation for study; 2) physical challenges of pregnancy and early days of motherhood; 3) strategies for success; and 4) support needs of student mothers. The findings indicate this cohort of students are intensely self-reliant and hopeful about the future they are building for themselves and their families, however, they were largely unaware of their rights and current support mechanisms. Clear policies that provide guidance for studying during early motherhood, would protect and support these resilient and engaged students, removing anxiety and providing stability at a time of transition.

Keywords

women in higher education; motherhood; student parents; mothers; pregnancy; sex discrimination; qualitative research; quantitative research; mixed methods

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Storytelling for Digital Content Development

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ABSTRACT

In online learning, AI-powered storytelling offers a solution for contextual and interactive content, fostering active learning and increasing retention rates. Educators can create dynamic online courses using AI tools to create personalised and interactive videos, providing students with richer learning experiences.

The paper discusses lecturers' experience developing digital content using the storytelling approach. Fifteen digital content developers from seven universities were involved in creating a training package on digital competency for lecturers in Indonesia. The storytelling approach was materialised through StoryJourney.ai, an AI-based e-journey video platform. Through the involvement, two new skills for the content developers were established: storytelling design and AI-based e-journey video development. The content developers reported that although their modules have met the storytelling approach standard, they consider that improvement is needed, especially in the interactivity of characters in the video, the argumentation plot and solutions presented in the video, the participants' engagement and interactivity, comprehensiveness and creativity of the video. Since StoryJourney video uses avatars, some content developers faced difficulties designing avatars suitable for adults, especially lecturers. They are satisfied with their experience in developing digital content based on storytelling. They would also see the possibility of using the StoryJourney video for scaffolding, i.e., engagement of different levels of analysis and evaluation or even case studies. Further studies are needed to tap into the users' perspective of the storytelling modules using the StoryJourney video to determine its usefulness and approach.

Keywords

Digital storytelling; digital content development; online learning, StoryJourney, Indonesia

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INTRODUCTION

The digital education landscape has transformed the pedagogical paradigm, ushering in an unprecedented era for educators characterized by both complex challenges and extraordinary opportunities for innovation. Traditional methodologies of digital content creation, which historically demanded extensive technical expertise and substantial resource allocation, have often proven daunting for educational practitioners, resulting in the production of digital courses that remain traditional in their conceptual framework and pedagogical approach (Wang et al., 2024). However, the emergence of artificial intelligence in educational contexts presents a remarkably promising avenue for transformative change, challenging educators to harness AI's transformative potential to create more innovative, engaging, and pedagogically effective educational content while ensuring ethical implementation and responsible technological integration (Dickey & Bejarano, 2023).

Storytelling has long been recognized as an effective pedagogical method for promoting learner engagement and knowledge retention across diverse educational settings, with research demonstrating its particular efficacy in digital learning environments (Liu, 2025). It has gained popularity as a comprehensive framework for developing digital courses that transcend traditional instructional design limitations. Storytelling has emerged as a strategy to present course content innovatively, where narrative frameworks provide concrete exemplification of otherwise abstract and inaccessible concepts while evoking profound emotional responses by tapping into patterns for the transmission of knowledge and cognitive orientation (Wilson, 2005). As such, storytelling conveys educational content in intellectually stimulating, aesthetically attractive, cognitively comprehensible, and motivationally compelling ways (Dahlstrom, 2014), while offering interpretative frameworks through narrative structures that facilitate cognitive reframing and the construction of shared understanding among diverse learning communities (Black, 2013).

Robin (2008) asserts that digital storytelling significantly enhances student comprehension by integrating multimedia elements that accommodate various learning modalities and appeal to diverse learning styles. By strategically combining narrative-based learning methodologies with advanced technological capabilities, educators can create immersive educational experiences that convey information effectively and foster profound emotional connections to educational material (Kusumo, et al., 2024). These sophisticated features are critically important in creating more innovative and engaging educational content that surpasses traditional approaches to digital content creation in terms of pedagogical effectiveness and learner engagement (Godsk & Moller, 2025).

Various storytelling tools powered by artificial intelligence, including AI-powered course builders and comprehensive content creation platforms, are increasingly available for educational practitioners to enhance their digital content development capabilities (Tan et.al., 2025). Advanced tools like StoryJourney.ai, an AI-powered educational platform, can be utilized to simplify storytelling integration in course development while enabling educators to create multimedia-rich, interactive videos specifically tailored for online learning environments (Smith & Thompson, 2020). This platform further advances storytelling applications in education by streamlining video production processes and enabling sophisticated interactivity features, allowing educators to produce professional-quality content with minimal technical complexity through automated editing capabilities, AI-driven content suggestions, and integrated assessment tools, including quizzes and decision-making elements (Smith & Thompson, 2020). The platform empowers educators to focus primarily on pedagogical

considerations, ensuring that their educational content remains engaging and precisely aligned with specific learning objectives while maintaining academic rigor (UNESCO, 2025).

In online learning environments, where the absence of traditional face-to-face interaction can contribute to learner disengagement and reduced educational effectiveness, AI-powered storytelling offers comprehensive solutions for maintaining and enhancing educational quality (Mohamed et al., 2024). Clark and Mayer (2016) suggest that interactive content, particularly when structured through sophisticated narrative frameworks, fosters active learning engagement and substantially increases knowledge retention rates across diverse student populations. By utilizing advanced AI tools to create personalized and interactive video content, educators can develop dynamic online courses that provide students with enriched learning experiences incorporating gamification methodologies within learning management systems, as evidenced by recent innovations in immersive gamification-based learning platforms (Pasila et al., 2024).

The integration of immersive gamification-based learning management systems represents a significant advancement in educational technology, as demonstrated by recent patent developments that showcase the convergence of storytelling, artificial intelligence, and gamification principles in creating comprehensive educational platforms (Pasila et al., 2024; Tegon, 2024). These technological innovations demonstrate the integration of multiple educational technology approaches in addressing the multifaceted needs of contemporary learners while maintaining pedagogical rigor and academic integrity (Ester et al., 2025).

LITERATURE REVIEW

Storytelling In Education

Storytelling has been recognized as an educational tool that enhances both cognitive understanding and emotional engagement within diverse learning environments, representing a fundamental pedagogical methodology with profound implications for knowledge construction and retention (Ruiz et al., 2024). According to Bruner (1991), storytelling facilitates meaning construction by organizing information within structured frameworks that resonate with inherent human cognitive processes and thought patterns. This narrative approach enables students to comprehend new information by establishing meaningful connections with familiar experiential contexts, thereby rendering learning experiences more memorable, impactful, and pedagogically effective (Du Plooy et al., 2024).

Contemporary research in educational technology demonstrates that storytelling involves the systematic conversion of factual content into structured narrative formats characterized by recognizable organizational patterns encompassing well-defined chronological sequences with distinct beginnings, developmental phases, and conclusive elements (Nwoga, 2000; Strielkowski, et al., 2024,). Storytelling entails the deliberate transformation of factual content and information into narrative formats known as 'stories,' which consistently adhere to recognizable structural frameworks, while also conveying intricate contextual details regarding specific temporal, spatial, and cultural environments within which educational scenarios unfold (Muscanell & Gay, 2025).

At the core of any educational story lies its plot, an essential course of action within the narrative framework that drives engagement and learning (Tobias, 2011). Educational scholars have identified plot patterns, each anchored in fundamental guiding principles such as adventure, discovery, emotional transformation, tension resolution, or personal growth (Früh, 2014). While these plot

structures can be strategically interwoven to create complex narratives, each provides a distinct framework complete with its own dramaturgy, character dynamics, and space-time arrangements that facilitate specific learning outcomes (Fischer et al., 2020).

Recent advances in digital storytelling research reveal that narrative methods play significant roles in constructing comprehensive learning ecosystems, with digital transformation and storytelling serving to bridge gaps between storytellers, diverse learning styles, and sophisticated evaluation systems (Liu, 2025). The learning ecosystem framework encompasses three critical components: digital learning environments integrated with digital storytelling capabilities, comprehensive digital storytelling learning ecosystems, and collaborative digital storytelling learning and teaching communities (Liu, 2025).

Storytelling exhibits diverse tonalities contingent upon its pedagogical purpose and intended learning outcomes. Informative or "serious" storytelling adopts educative or content-focused approaches specifically designed to stimulate learning processes and facilitate conceptual change within learners (Downs, 2014). The adaptability of storytelling tonality enables educators to employ persuasive or deliberative approaches depending on specific instructional goals, with narrative structures serving to convince audiences of educational messages through character-driven influence mechanisms (Geiger et al., 2018).

Storytelling for digital content creation is the telling of a story

1. with a distinct arrangement of characters and courses for action (plot),
2. which focuses on characters and their experiences (personalization) and
3. presents a configuration of arguments, inquiries, and solutions (dramaturgy),
4. has recognizable beginning, middle and end (chronology),
5. provides information about the temporal, spatial or cultural setting (context),
6. creates inner tension by employing stylistic devices (stylistics),
7. using a distinct tone (tonality)
8. and a more or less interactive and immersive way of presentation (modality),

to facilitate the education of the audience and promote change towards sustainability (normativity) (Geiger et al., 2018).

Digital Storytelling And Multimedia Learning Integration

In the contemporary digital age, storytelling has evolved into sophisticated digital storytelling methodologies that integrate multimedia elements—including video, audio, and interactive components—to engage learners across multiple sensory channels and accommodate diverse learning preferences (Jenkins, 2007). Robin (2008) highlights that digital storytelling supports diverse learning modalities, particularly benefiting visual and auditory learners by enabling educators to present information through multiple complementary formats. Through the strategic combination of textual content, visual imagery, and interactive elements, educators can create immersive educational experiences that appeal to heterogeneous student populations with varying learning preferences and cognitive styles (Robin, 2008).

Digital storytelling methodologies align with constructivist learning theory, which emphasizes the critical role of active participation and experiential engagement in knowledge acquisition processes (Clark & Mayer, 2016). Recent studies reveal that technology-based learning significantly increases

student engagement, both in terms of active classroom participation and sustained motivation for continued learning (Kusumo, et al., 2024). The implementation of digital platforms, including learning management systems, demonstrably improves students' organizational capabilities, enhances access to course materials, and facilitates effective time management while promoting self-directed learning (Muscanell & Gay, 2025).

Best practices in digital storytelling implementation include the utilization of clear narrative structures, ensuring pedagogical alignment of multimedia elements, and incorporating interactive features that promote active learning engagement (Clark & Mayer, 2016). Clark and Mayer emphasize the importance of balancing cognitive load in multimedia presentations, suggesting that educational content should be designed to avoid overwhelming students with excessive information while maintaining engagement and educational effectiveness. Effective storytelling in educational contexts should offer a strategic balance between engagement and educational content, ensuring that students can retain and apply the knowledge presented through narrative frameworks (Candido & Cattaneo, 2025).

E-Journey Platforms For Digital Learning Modules

The emergence of sophisticated e-learning platforms like eJourney.id (Figure 1) has facilitated the creation and distribution of digital storytelling modules for educators across diverse institutional contexts (Johnson et al., 2015). These platforms function as comprehensive educational marketplaces where educators can create, share, and monetize educational modules while accessing collaborative content creation tools and AI-enhanced personalization features (Johnson et al., 2015). The concept of bite-sized learning—providing educational content in small, manageable segments—has emerged as a core design principle of these platforms, reflecting contemporary understanding of cognitive load theory and optimal learning conditions (Clark & Mayer, 2016).

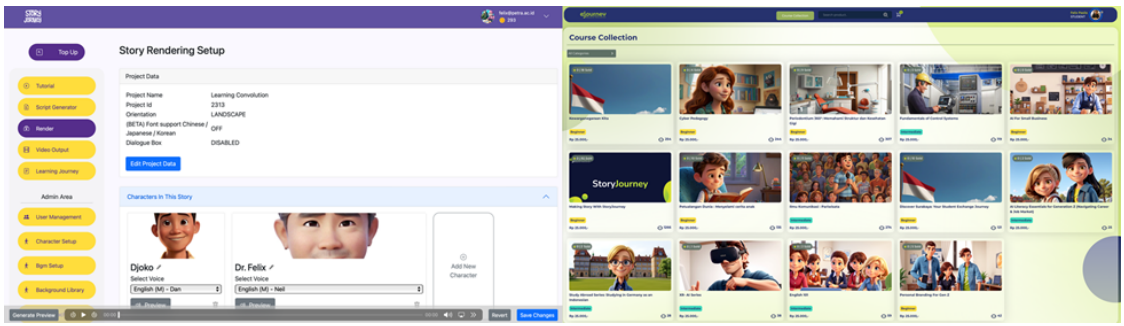


Figure 1. Platform of storyJourney.ai and its marketplace

(https://creator.ejourney.id/course/marketplace)

Research by Clark and Mayer (2016) suggests that bite-sized learning methodologies help reduce cognitive load, making it easier for learners to absorb information in short, focused bursts rather than in long, dense lessons that may overwhelm cognitive processing capabilities. E-journey platforms combine collaborative content creation capabilities with AI-enhanced personalization features to improve learning outcomes across diverse student populations (Tan, et al., 2025). Johnson et al. (2015) noted that personalized learning approaches, where artificial intelligence adapts content delivery to meet individual learner needs, preferences, and knowledge gaps, prove particularly effective in e-learning environments.

Contemporary personalized learning represents a systematic instructional design approach that focuses on tailoring instruction to individual students' strengths, preferences, needs, and goals, resulting in well-rounded educational experiences that provide flexibility and support in determining what, how, when, and where students learn and demonstrate mastery (Zhang et al., 2020). This comprehensive approach enables student voice and choice based upon their interests and prior learning experiences while leveraging technology to enhance access to quality learning experiences for all learners (Zhang et al., 2020). In this sophisticated educational ecosystem, platforms like eJourney.id not only support educators in the creation of their digital modules but also provide comprehensive environments where educators can access, refine, and adapt materials created by other educational practitioners (Alarfaj & Alrashidi, 2025).

The integration of artificial intelligence in platforms such as eJourney.id assists educators in content design processes by suggesting multimedia components and interactive features that align with specific pedagogical goals (Smith & Thompson, 2020). This AI integration reduces technical complexity in digital module creation, allowing educators to focus primarily on pedagogical considerations rather than technical multimedia production challenges (UNESCO, 2025). Recent developments in AI-powered learning platforms demonstrate significant potential for motivating and enhancing learning experiences across diverse cultural and academic settings (Alarfaj & Alrashidi, 2025).

Competencies For Educators Using AI Tools

For educators to fully leverage AI-enhanced storytelling platforms like StoryJourney.ai effectively, they must acquire comprehensive sets of digital and pedagogical competencies that extend beyond traditional subject matter expertise (UNESCO, 2025). The increasing integration of artificial intelligence in educational contexts requires educators to develop proficiency in technology-enhanced instructional design and multimedia content creation while maintaining pedagogical effectiveness (Godsk & Moller, 2025). Digital literacy has become critically important for educators who are expected to design, produce, and manage multimedia-rich content that effectively engages students within digital learning environments (Smith & Thompson, 2020).

Recent research in digital competency development reveals that specialized training programs can effectively enhance educators' digital competence, particularly when tailored to specific educational contexts and individual professional development needs (Hormann et al., 2024). The UNESCO (2025) framework for teachers' digital competencies emphasizes the importance of systematic professional development approaches that address both technical skills and pedagogical integration strategies.

Key competencies for contemporary educators include advanced digital content creation skills, requiring comfort with digital tools for creating and managing multimedia elements such as video editing software, graphic design platforms, and audio recording technologies (Smith & Thompson, 2020). In AI-driven platforms like StoryJourney.ai, educators can leverage built-in AI tools to simplify these technical tasks, reducing the specialized knowledge required while still producing professional-quality educational content. AI tools facilitate the creation of more adaptive learning environments by automating repetitive tasks and providing real-time feedback based on student performance data (Smith & Thompson, 2020).

Effective digital storytelling module creation requires understanding student engagement principles and emotional resonance, as emotional engagement represents a critical factor in learning retention and knowledge transfer. Robin (2008) emphasized that digital storytelling must appeal to students'

emotions, as emotional engagement constitutes a fundamental component in learning retention and long-term knowledge application.

Significance of the Study

Online courses must be strategically designed to be engaging and intellectually stimulating for users while maintaining rigorous academic standards and pedagogical effectiveness (Godsk & Moller, 2024a; OECD, 2025). With the advancement of technology and artificial intelligence, course developers can exercise creativity while maintaining the quality of course content in designing and developing their online courses (Mohamed et al., 2024b). The utilization of storytelling methodologies for designing online courses in the training packages on Digital Competency for Lecturers in Indonesia, combined with AI-assisted learning video development, is intended to create contextual training packages using various engaging AI-assisted media to achieve specific learning outcomes (Wang et al., 2024a).

The development of online courses is standardized to offer personalized learning experiences for users while ensuring consistency in educational quality and learning outcomes (Du Plooy et al., 2024). There are six comprehensive modules of the online training packages on Digital Competency for Lecturers in Indonesia being developed by fifteen lecturers from seven universities in Indonesia, representing a significant collaborative effort in educational technology innovation (UNESCO, 2024). This study aims to identify the perceptions of course developers in designing and developing online courses which integrate the storytelling approach using various AI-assisted learning videos (Tegon, 2024).

The significance of this research extends across multiple dimensions of educational technology theory and practice, addressing critical gaps in understanding how AI-enhanced storytelling approaches can transform digital content development in higher education contexts (Wang et al., 2024a). This study contributes to the expanding theoretical framework of AI-integrated educational technology by providing empirical evidence for the effectiveness of storytelling methodologies in digital learning environments while establishing comprehensive frameworks for future educational innovation initiatives (Liu, 2025).

It is expected that the results of this study will equip course developers to be creative with new approaches and skills in designing and developing online courses, which are becoming increasingly popular means of study in higher education nowadays (Muscanell & Gay, 2025). The research findings will provide valuable insights into the practical implementation of AI-enhanced storytelling in educational contexts, offering evidence-based recommendations for educational technology adoption and implementation strategies (Mohamed et al., 2024b).

Furthermore, this study addresses the urgent need for evidence-based guidance in implementing AI-powered educational technologies within higher education institutions, particularly in developing educational contexts where resource constraints and technical expertise limitations may present additional challenges (UNESCO, 2024). The research provides practical insights into the challenges and opportunities associated with AI-integrated storytelling platforms, offering actionable recommendations for educational technology implementation strategies that can be adapted across diverse institutional contexts (Mohamed et al., 2025).

METHOD

Research Method

This study employs a descriptive research method, aiming to explore and understand lecturers' perceptions as course developers in designing and developing online modules that incorporate the storytelling approach using AI-assisted video tools, particularly StoryJourney.ai. The descriptive method is suitable for capturing reflections and subjective experiences related to the course development process.

Research Design or Model

The ADDIE model (Analysis, Design, Development, Implementation, and Evaluation) was adopted as the guiding framework for course design and development (https://research.com/education/the-addie-model). This instructional design model was used in combination with storytelling principles and the integration of AI-based e-journey video via StoryJourney.ai. The application of ADDIE ensures a systematic process from needs analysis through to evaluation, adapted to include the narrative-based approach central to this study.

Data Collection Tools

Data were collected using a 25-item digital questionnaire that assessed lecturers' perceptions across two key dimensions: the Use of storytelling (17 items), and the Use of e-journey video (8 items), plus one item for general comments. Each item was measured using a 7-point Likert scale, where 1 indicated the most negative perception and 7 indicated the most positive. The questionnaire items were developed based on prior research on factors important in online course design (Pannen, 2023), ensuring alignment with recognized standards.

Sampling

The research involved 17 course developers from eight higher education institutions in Indonesia;:Universitas Terbuka (UT), Institut Teknologi Sepuluh Nopember (ITS), Universitas Bina Nusantara (Binus), Universitas Negeri Makassar (UNM), Universitas Indonesia (UI), Universitas Gadjah Mada (UGM), Universitas Pradita, and Universitas Pelita Harapan (UPH).

The course developers were selected by the universities based on their prior experience in designing online courses and assignments. While 15 respondents formally completed the questionnaire, the final dataset comprised 18 entries, reflecting the contribution of multiple modules by individual course developers.

In addition, three members of the StoryJourney development team provided guidance and support throughout the video creation process. These individuals were also included as respondents and participated in reflective interviews to evaluate the development experience. Further input was obtained from one instructional designer and two content development specialists, who contributed to preparing the modules for the pilot testing phase.

Research Procedures

The research process began with a training workshop, introducing the course developers to:

- Online course development standards,
- The storytelling approach in education,
- The use of StoryJourney.ai for e-journey video creation.

During the workshop, the course developers received hands-on guidance from the StoryJourney.ai development team, particularly on the technical aspects of video production. This support extended beyond the workshop period, with continued mentoring and troubleshooting assistance.

Following the workshop, course developers progressed independently with their module development, supplemented by weekly Zoom-based mentoring and monitoring sessions. Upon completion of the draft modules, expert reviews were conducted by an instructional designer and content specialists. Based on their feedback, revisions were implemented to refine the modules for a small-scale pilot test aimed at evaluating usability and instructional effectiveness.

Validity And Reliability Measures

The items in the questionnaire were constructed based on an existing validated framework from a prior survey (Pannen, 2023), ensuring content validity. While no statistical reliability tests (e.g., Cronbach's alpha) were reported due to the limited sample size, the consistency of the responses across dimensions and the structured development of the instrument contribute to its reliability. Moreover, development team reflection and expert review of the developed modules provided additional validation of both content quality and alignment with the storytelling framework.

FINDING AND DISCUSSION

Perspectives From Lecturers As Digital Content Creators

The use of StoryJourney.ai, an AI-powered application, is intended to significantly enhance educators' ability to produce high-quality digital storytelling content. By automating technical tasks and providing AI-driven suggestions, educators are expected to create interactive modules more efficiently without sacrificing quality.

This first part of the study explores lecturers' perspectives in their role as digital content creators, with a particular emphasis on the eight key indicators characterizing e-journey video features.

Following the module design phase and preceding development, lecturers were introduced to the e-journey video format as an alternative to conventional slide-based presentations. They were guided to employ this medium as a narrative tool, enabling them to convey subject matter through story-driven content. Each story was expected to incorporate the eight designated features, which are intended to facilitate learner engagement and enhance the instructional effectiveness of the module.

Table 1 presents lecturers' reflections on the integration of storyjourney videos within their instructional modules. A majority indicated that the videos were easy to understand ($\bar{x}$ = 5.94 on a 7-point scale) and believed they facilitated the learning process ($\bar{x}$ = 5.89). However, respondents expressed scepticism regarding the appropriateness of storyjourney videos for use by lecturers ($\bar{x}$ = 5.50) and their acceptability for adult learners ($\bar{x}$ = 5.56). This scepticism primarily stemmed from the use of avatars and the platform's current developmental limitations, including the absence of realistic

elements such as authentic lecturer voices, natural movements, and group interaction displays. These concerns indicate the need for a pilot test involving actual users—specifically, lecturers engaged in capacity-building initiatives focused on enhancing digital competencies.

Table 1. Storyjourney Video Features

Indicator	N	Min	Max	Mean	Std Dev
The storyjourney video makes the module interesting	18	5	7	5.83	.618
The storyjourney video is useful for learners	18	4	7	5.83	.707
The storyjourney video is acceptable for adult learners	18	3	7	5.56	1.199
The storyjourney video is creative	18	4	7	5.67	.686
The storyjourney video is motivating	18	3	7	5.72	.958
The storyjourney video is easily understood.	18	4	7	5.94	.725
The storyjourney video facilitates learning process	18	4	7	5.89	.832
The storyjourney video is considerably appropriate for lecturers	18	4	7	5.50	.985

Qualitative feedback collected from lecturers—serving as digital content creators—offers valuable insights into the practical challenges and opportunities associated with integrating AI-powered storytelling tools into online courses. Notably, the scepticism voiced by several lecturers centres on the use of avatars and the platform's current developmental limitations, such as the lack of realistic features including natural human voice, movement, and group interaction representations. Many content creators emphasized the need for more advanced avatar customization capabilities to better align with adult learning contexts, particularly within professional and academic environments. In addition, these concerns highlight the importance of conducting a pilot test with actual users—namely, lecturers involved in capacity-building programs aimed at strengthening digital competencies.

Despite these limitations, most lecturers expressed appreciation for the intuitive interface and streamlined workflow offered by StoryJourney.ai.. Given their limited prior experience with multimedia production, many noted that the platform enabled them to concentrate more effectively on pedagogical design and storytelling, rather than on technical aspects such as video editing or animation.

After they have gained knowledge and skills on the technicalities of developing story using Storyjourney Video, the lecturers as digital content creators then immersed in developing the story for their modules. Table 2 illustrates the perspectives of the lecturers as digital content creators on the development of modules that tells stories, focusing on the 17 indicators of storytelling.

Table 2. Storytelling Indicators

Indicator	N	Min	Max	Mean	Std Dev
The module meets the criteria for a digital module based on storytelling principles.	18	4	7	6.11	.758
The module has plots	18	3	7	5.72	.895
The module incorporates a structured narrative flow.	18	4	7	5.89	.758
The module follows a coherent structure comprising an introduction, body, and conclusion	18	4	7	5.83	.786
The module emphasizes the role of the characters and the interaction among them	18	3	7	5.67	.970
Dramatization is included in the module	18	4	7	5.39	.850
There are arguments presented in the module	18	4	7	5.61	.778
The provided solution is explained clearly	18	4	7	5.56	.922

Indicator	N	Min	Max	Mean	Std Dev
There are segments in the module that are inspiring.	18	4	7	5.78	.808
There are segments in the module that are motivating	18	5	7	5.94	.725
There are segments in modules that influence the users/lecturers' feeling.	18	4	7	5.67	.686
The module is presented in an interactive mode	18	3	7	5.61	1.037
The module employs a communicative language style.	18	5	7	5.89	.758
The module is delivered through a variety of learning mode	18	5	7	5.61	.608
The story in the module is comprehensive	18	4	7	5.61	.778
The story in the module is contextual	18	5	7	5.89	.583
The module utilizes various complementary media formats	18	4	7	5.72	.958

A majority of lecturers reported that their modules met the criteria for digital learning content grounded in storytelling principles ($\bar{x}$ = 6.11 on a 7-point scale). They also noted deliberate efforts to incorporate motivational segments ($\bar{x}$ = 5.94), contextual relevance to their instructional environments ($\bar{x}$ = 5.89), structure narrative flow ($\bar{x}$ = 5.89), and use communicative language styles ($\bar{x}$ = 5.89) that contributed to more accessible storytelling. Additionally, they followed a coherent narrative structure comprising an introduction, body, and conclusion ($\bar{x}$ = 5.83).

However, lecturers acknowledged several limitations. Most did not incorporate dramatization within their modules ($\bar{x}$ = 5.39), tended to adopt a prescriptive writing approach that omitted explanatory depth to the provided solution ($\bar{x}$ = 5.56), and provided limited argumentation ($\bar{x}$ = 5.61). Further reflections revealed concerns about narrative comprehensiveness ($\bar{x}$ = 5.61), lack of interactivity ($\bar{x}$ = 5.61), and absence of multimodal delivery formats ($\bar{x}$ = 5.61), suggesting opportunities for pedagogical enhancement.

Qualitative feedback emphasized the value of ongoing support and constructive input throughout the content development process. Mentoring sessions and peer discussions—both during and after the workshop—were instrumental in helping developers conceptualize and refine narrative elements such as plot structure, character development, and interactivity. Developers also reported the need for more training in narrative writing and storytelling design, and proposed several platform enhancements, including a library of storytelling templates and automated guidance for narrative pacing—particularly when developing longer or modular learning content.

Perspectives From Platform Developers

The StoryJourney.ai development team played a substantial role in shaping the digital content for the modules, particularly through their involvement in the creation of StoryJourney videos. Their goal was to ensure that the platform remains both pedagogically effective and universally accessible. Their design philosophy is the reduction of technical barriers for educators, achieved through the integration of features such as AI-assisted editing, voice synthesis, scene transitions, and interactive branching logic.

Platform developers highlighted the iterative nature of feature enhancement, noting that educator feedback is continuously incorporated into updates to address evolving instructional needs. Regular guidance and constructive feedback were provided throughout the development cycle to strengthen course developers' understanding of digital pedagogy and content creation. Notably, they emphasized the reciprocal value of this collaboration—not only did it support the course developers' capacity

building, but it also generated actionable insights for refining the platform itself based on authentic user experiences.

A major development focus has been the refinement of the AI engine that supports content recommendation, visual coherence, and originality—enabling the rapid generation of high-quality video. Course developers increasingly view themselves not merely as technology users, but as pedagogical co-creators, working closely with instructional designers and lecturers, and supported by the development team to translate abstract academic concepts into emotionally and contextually grounded stories.

Perspectives From Experts

Experts in instructional design and content development reaffirm the critical role of AI-powered storytelling platforms in fostering engaging, scalable, and personalized online education. Platforms such as StoryJourney.ai are viewed as responsive solutions to the growing need for contextualized digital content and enhanced learner engagement, particularly in environments where the lack of face-to-face interaction may contribute to disengagement.

However, experts caution that technological tools alone are insufficient for meaningful instructional transformation. The successful integration of such platforms must be accompanied by robust institutional support systems, learning support structures, and comprehensive educator training. This training should extend beyond technical proficiency to encompass capacity-building in narrative thinking, digital pedagogy, and visual literacy. Importantly, digital storytelling is emphasized not as a supplementary feature, but as a pedagogical strategy intrinsically aligned with learning objectives and student needs. As articulated by Clark and Mayer (2016), effective multimedia learning depends on balancing cognitive load with immersive narrative design, thus preventing learner overload while enhancing conceptual clarity.

Collectively, both platform developers and instructional experts agree that—when implemented thoughtfully and with appropriate support—AI-powered storytelling tools possess the potential to significantly enhance digital content development and enrich the online learning experience, particularly within professional development and higher education contexts.

CONCLUSION, IMPLICATIONS, AND SUGGESTIONS

This study demonstrates the potential of integrating AI-powered storytelling—specifically through the StoryJourney.ai platform—into digital content development for higher education. By leveraging storytelling principles and AI-generated e-journey videos, lecturers as course developers were able to design and develop online courses that are more engaging, personalized, and contextually rich. The use of storytelling frameworks enabled course developers to enhance emotional engagement, facilitate conceptual understanding, and foster deeper learner interaction.

The findings indicate that lecturers were generally positive about the experience, reporting increased competencies in storytelling design and AI-based video development. Despite challenges in avatar design and the complexity of ensuring interactive narratives, participants expressed satisfaction with the platform's ability to support their pedagogical goals of the course.

Implications

The integration of storytelling and AI tools into online course development has several important implications:

1. For Educators: The findings suggest that with proper support and training, educators—even those without strong technical backgrounds—can successfully utilize AI platforms to produce high-quality digital learning modules. This democratizes content creation and expands opportunities for innovation in teaching practices.
2. For Educational Institutions: Institutions can consider incorporating AI storytelling tools like StoryJourney.ai into faculty development programs. Doing so can promote a shift toward more learner-centered, narrative-based instruction, particularly important in asynchronous or remote learning environments.
3. For Platform Developers: Continuous user feedback from educators indicates the need for more context-sensitive avatar options, advanced interactivity, and built-in narratives. These inputs are essential for enhancing the user experience and pedagogical effectiveness of the platform.
4. For Policy and Curriculum Designers: AI-assisted storytelling could be embedded into national frameworks for digital competency development, particularly in contexts such as microcredentials, continuing professional development (CPD), and lifelong learning.

Limitations

While the study provides valuable insights, several limitations must be acknowledged:

- The sample size was relatively small (n=15, with 18 modules), which may limit the generalizability of findings.
- The study focused on the developers' perspectives only, without integrating data from the actual users or learners who engage with the final course modules.
- The evaluation of module quality was conducted by experts, but longitudinal data on learning outcomes and engagement are not yet available.
- The interactivity level of AI-generated videos is still somewhat constrained compared to custom-built multimedia tools.

Suggestions For Future Research and Practice

To build on this research, the following suggestions are proposed:

- Expand the study to include learner perspectives and learning analytics to assess the actual impact on engagement, comprehension, and retention.
- Conduct comparative studies between modules using traditional video content and those using AI-based storytelling to evaluate effectiveness.
- Encourage platform developers to incorporate user-generated avatar libraries, multi-language support, and adaptive storytelling pathways.
- Integrate storytelling-based design into faculty certification or training programs to broaden educator exposure to narrative-based pedagogy.
- Investigate the role of storytelling in fostering higher-order thinking skills, such as reflection, analysis, and synthesis in digital learning environments.

Possible Impact and Applications

The successful adoption of StoryJourney.ai in this context signals its potential for scaling up innovative digital education practices, especially in developing countries where access to advanced multimedia development tools is limited. Storytelling via AI has broad application in areas such as:

- Teacher training and certification programs,
- Online learning modules in higher education,
- Corporate and vocational training,
- Scalable MOOCs and microcredentials.

By merging technology, narrative design, and pedagogical intent, AI-powered storytelling has the capacity to transform online education into a more meaningful, personal, and effective learning experience.

AUTHOR'S CONTRIBUTIONS (CRediT)

Paulina Pannen: Conceptualization, Methodology, Writing – Original Draft, Supervision, Felix Pasila: Investigation, Resources, Writing – Review & Editing, Rahayu Dwi Riyanti: Data Curation, Visualization, Writing – Review & Editing. Afriani: Formal Analysis, Project Administration, Writing – Original Draft

All authors have read and agreed to the published version of the manuscript.

Data Accessibility Statement

The data supporting the findings of this study are available upon reasonable request from the corresponding author. Due to privacy concerns and institutional regulations, the raw data are not publicly available.

Ethics and Consent

This study did not involve human subjects in a manner requiring ethical clearance. However, informed consent was obtained from all participating course developers for the collection and analysis of their feedback. Institutional permissions were obtained where necessary.

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Co-Designing AI Guidelines Through an AI Literacy Lens

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ABSTRACT

Artificial intelligence (AI) tools have the potential to greatly enhance teaching and learning, but equally, they can undermine the self-reliance of learners and lead to inauthentic teaching and assessment processes. In response, many educational institutions have created policies and guidelines about AI use, but learners often lack the appropriate AI literacy to understand and follow them effectively. A co-design process, where the development of AI guidance is collaboratively undertaken by educators and learners, provides one way to address this problem, and contributes to openness in innovation. This article describes the process and outcomes of a co-design process, supported by the Scaffolded AI Literacy (SAIL) framework, that was used to develop a set of principles to support guidelines for the use of AI in learning within one institution. The combination of co-design and AI literacy was used to ensure not only that learner voice was valued but also that AI literacy development was considered by participants during the process of developing the guidelines. A combination of surveys and focus groups was used to support the co-design process, which provided a range of perspectives on how students and educators perceive the role of AI in the teaching and learning process, and the AI literacies required to support a common set of principles to underpin the development of guidelines that can meet the needs of all stakeholder groups.

Keywords

AI literacy; co-design; guidelines; postgraduate; focus group; survey; principles

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INTRODUCTION

This article discusses the motivation and process for co-designing a set of guidelines for the responsible use of generative artificial intelligence in a higher education context. The institution concerned is a private graduate school in New Zealand that offers a range of postgraduate qualifications in areas such as education, technology, sustainability, and change management. In 2023, soon after students and staff began experimenting with generative artificial intelligence (GenAI) tools in their educational activities, the institution adopted a set of guidelines to assist students in the appropriate use of these tools to support their learning. These guidelines were developed quickly by one staff member as an interim measure to ensure that some level of guidance was made available as soon as possible.

The intent of these guidelines was not to attempt to ban the use of AI, but to encourage critical and ethical usage. However, since those guidelines were created, a range of issues with student use of GenAI tools that staff considered inappropriate were raised. These included uncritical and/or undeclared use of AI tools, and a lack of awareness of, and critical reflection on, how individual AI tools operated. Specific consequences of this were students failing assessments by submitting work that was not their own, and basing discussions on non-existent sources. The impact on staff was an increased workload due to addressing students' inappropriate use of AI. It was clear that more appropriate guidance was required, and, based on the experiences of other educators, it was believed necessary to ensure a more inclusive process of co-design to engage a range of stakeholders in creating a new set of guidelines.

A key assumption of this effort was that each educational context would have different interpretations of what constitutes the appropriate uses of AI tools, based on the nature of the institution and the types of students who enrol. Therefore, it is unlikely that using generic guidelines from other contexts will provide an ideal framework for progress or ensure student buy-in to the process. It therefore follows that a collaborative and situated process such as co-design is necessary to reflect the specific characteristics of the institution and the members of its learning community. Importantly, a set of guidelines that is openly co-designed with members of the student body is more likely to be successful than one imposed from above by the institution. This focus on one context does raise questions around the generalisability of any findings from this type of exercise. However, it may be helpful for others to consider the process and outcomes of this particular co-design example in performing similar exercises in their own contexts. While the outcomes may be different, the process and underlying principles may be similar.

LITERATURE

The rapid emergence of generative artificial intelligence (GenAI) tools has prompted many educational institutions to develop guidelines for AI use in teaching, learning, and assessment. However, many institutional guidelines overlook significant issues in AI tool use, privacy, and transparency (Ghimire & Edwards, 2024) as well as equitable access (Jin et al., 2025), and even where such guidelines exist, students may be uncertain about their institution's policies (Baek et al., 2024). In addition, successful implementations of such guidelines require supporting processes to develop relevant AI literacies in staff and students (Funa & Gabay, 2025).

Co-Design

It has been suggested that the development of these guidelines should involve a diverse range of stakeholders (Brandon et al., 2025), such as that followed in a co-design process, which can result in transformative, rather than transactional, outcomes, where students are more likely to follow the guidance provided (Ohio State University, n.d.). Students are not bystanders in this process and are interested in opportunities to openly co-design their engagement with AI technologies (Cardona et al., 2023).

Co-designing guidelines requires not just student participation but a process for how co-design is structured, implemented, and evaluated (Ambrosetti et al, 2025). Part of this process involves managing power dynamics, so students' contributions carry weight. In addition, co-design should involve more than one cycle of engagement with students to ensure that their voice is heard in the final product (Smith, F. et al., 2024). However, it should also be noted that effective facilitation, support and guidance from academic staff were identified as the most important enablers of effective co-design in a study relating to the design of assessments, so staff need to take responsibility for the overall process (Smith, A. et al., 2024). An additional factor is that, for students to meaningfully participate in designing AI guidelines, they require a certain level of AI literacy, understanding what AI is, how it works, and its societal impacts. For example, they need to understand issues like bias, data privacy, and how AI may generate inaccurate information so they can contribute to the design of sensible guidelines.

AI Literacy

For students to be able to navigate and leverage AI technologies effectively, a level of AI literacy is required (Funa & Gabay, 2025). The concept of AI literacy began to emerge in the literature around 2016. For example, Konishi (2016) conceptualised it as being able to recognise tasks that can be performed by AI, and learning and investing in the human strengths that it cannot replace. In contrast, Kandlhofer et al. (2016) took a more technical view, emphasising the techniques and concepts behind AI products and services. Since that time, these different foci of conceptual and technical have been developed in the literature. For example, Cui & Wheatcroft (2021) stated that AI literacy could be understood as skills and technical abilities, applications and practical considerations, and transformative thinking, experiences and considerations. These diverse perspectives made it clear that AI literacy covers a wide range of knowledge, skills and understanding, and over time, there has been a growing awareness that AI literacy is a broad, interdisciplinary theme (Fadel et al., 2024). From the broad concepts of AI literacy, a range of AI literacy frameworks has emerged. An AI literacy framework can take many forms, but its main objective is to provide an organised way of thinking about how someone might scaffold their learning about AI, via guidelines, competencies and/or knowledge areas related to AI. A key aspect of these frameworks is the extent to which they support the development of AI literacy over time and through different levels of competency. Examples of frameworks that address this progression include the UNESCO framework for students (Miao & Shiohira, 2024) and the SAIL framework (MacCallum et al, 2024). The latter framework has been applied in this study.

METHODS

The research design for this study was a co-design process, with the methods used within this process being a survey and focus groups. Co-design was chosen as a suitable participatory research method to actively involve the various members of a learning community in shaping the development of AI

guidance that met the needs of that community. The strength of co-design in this context was to bring together a diverse group of learners and educators to create guidance that was appropriate to all members of the learning community and also gave insights into the AI literacies required for the implementation of this guidance to be successful. Ethics approval was obtained from the institutional ethics panel prior to data gathering.

The process began with the dissemination of an anonymous survey to all members of the learning community (both students and staff). The sample, of necessity, comprised those associated with the institutional context, given the aim of the study to create AI guidelines appropriate to that context.

The design of the survey was based on addressing questions in several categories.

1. Identifying the respondent's role in the learning community
2. Gathering data on the respondent's current usage of AI in their educational context
3. Understanding the respondent's current awareness of the existing AI guidance and their responses to it
4. Asking which areas of AI usage the respondents wanted the guidelines to provide support for
5. Assessing the respondent's current level of AI literacy
6. Gathering broader data on how respondents feel about the benefits and risks of AI in learning and its impacts on academic integrity

The fifth category of questions was based on some of the key elements from level 1 of the SAIL framework – 'know and understand AI' - which is intended as a set of capabilities applicable to all learners at all levels. The framework is divided into six categories in three domains. The questions in the survey were not intended to be an exhaustive assessment of all aspects of AI literacy in the framework. Rather, they addressed some of the most fundamental competencies, with indicative rather than exhaustive questions, to enable us to assess in very general terms whether our respondents had any areas of weakness in their AI literacy. Table 1 shows the AI literacy questions used in the survey with their related competencies.

Table 1: Survey questions related to the Scaffolded AI Literacy (SAIL) Framework

Domain	**Category**	**Competencies and Related Questions**
Concepts	The Impacts of AI	Identify when people are using AI "I know when I am using a tool that includes AI" Describe how AI is impacting society "I am aware of the social impacts of AI" Give examples of how AI has impacted different sectors "I am aware of how AI is impacting education"
	What AI Is & How It Works	Compare and contrast the main features of AI technologies "I understand the basic principles of how AI tools work" Explain how users can interact with AI systems, including natural language "I understand the ways that AI is being used and how users can interact with it"

Application of AI & Technical Skills	Cognitive Skills	Identify the useful features of AI technologies when applied in specific contexts "I understand the capabilities of AI tools" Assess the implications of using AI for a specific purpose or context "I understand the limitations of AI tools" "I am aware that AI tools can generate incorrect information"
	Applied Skills	Select and apply suitable AI tools to perform specific tasks (e.g., collaborate, communicate, solve problems) "What academic or related purposes do you currently use AI tools for?" Apply AI tools in specific contexts to achieve personal, learning or work-based goals "I can apply AI tools effectively across a range of tasks" Evaluate the suitability and outcomes of using a range of AI tools across a range of tasks "I always validate (check that it is accurate) the information or outputs given to me by AI tools"
AI Digital Citizenship	Social, Cultural, & Ethical Issues	Identify the ethical implications of AI (e.g., bias, fairness, transparency, accessibility, accountability) "I am aware that AI tools can generate biased information" "I am aware of the ethical impacts of AI" Explain the relationships between AI, data, and cultural contexts and values "I am aware of the cultural impacts of AI"
	Risks & Mitigations	Identify risks presented by AI systems (e.g., security, personal data, privacy, fraud, cyber threats) "I am aware of the privacy policies of the AI tools that I use" Demonstrate responsible and safe behaviours toward AI and the threats it poses through misuse "I am aware of the potential risks presented by AI to me as an individual and how to behave responsibly and safely when using it"

Most of the quantitative elements of the survey used a 5-point Likert scale, alongside two multi-select, multiple-choice questions. There were also several qualitative, open-ended questions. The final part of the survey gave respondents the opportunity to volunteer to participate in a focus group to help co-design a new set of AI guidelines.

The survey was distributed through the Slack channels used to communicate with the members of the various programmes offered by the institution.

After the results of the survey were analysed, two online focus groups were held, comprising those respondents to the survey who had indicated a willingness to take part. The first focus group was provided with a summary of the results of the survey prior to the meeting. Then, in the focus group meeting, they were asked to provide their feedback on these results and to suggest how these findings might help to inform the development of a new set of AI guidelines. The outcomes of this focus group were summarised and circulated, and the second focus group developed their ideas further by building

on the outcomes of the first meeting. From this second focus group, the initial draft of a new set of principles to support AI guidelines was produced, along with a suggested mapping to AI literacies that were needed to assist learners and educators to apply these principles effectively.

ChatGPT was used to help analyse the data from the two focus groups, suggesting response categories and highlighting key points of view for consideration by the research team. To ensure data privacy, private transcripts were created during the two online meetings from a private Zoom account. These transcripts were analysed using a temporary chat in a ChatGPT Plus account to ensure that the data was not made available as training data.

FINDINGS AND DISCUSSION

This section discusses the responses to the survey, how the first focus group responded to these and developed an initial set of key focus areas for AI guidance, and how this was further developed by the second focus group to provide the basis for the draft AI guidance.

Findings From the Survey Data

The survey received 26 responses. Had this study relied on this survey as its primary source of data, this would not have been sufficient. However, since the primary role of the survey was to gather some baseline data to feed into the focus group cycle, for which the survey was the recruitment device, then it was usable for these purposes.

Table 2 shows the ten most common ways in which respondents were currently using generative AI tools for academic or related purposes. This was based on a multi-select multi-choice question with 24 options (including 'other'). From a positive perspective, these reflect other work that suggests students find AI valuable for improving efficiency, brainstorming, understanding, and providing personalised support (O Donnell et al., 2024). It is worth noting, however, that several of these uses are potentially problematic in terms of supporting student learning and maintaining the authenticity of assessment if students are using these tools uncritically. For example, if students delegate researching, structuring and writing their assessment to AI without developing their own knowledge, critical thinking and communication skills, then the process of learning is undermined.

Table 2. Respondents' use of GenAI tools for academic or related purposes

Position	GenAI use	Count
1	Researching	22
2	Improving writing style / Proofreading / Grammar	22
3	Brainstorming	21
4	Summarising sources (text or video)	18
5	Drafting or planning structure	18
6	Writing	15

7	Answering questions	15
8	Getting feedback on written work	14
9	Creating/editing images or video	14
10	Interrogating/chatting with source materials	14

Table 3 shows which capabilities the respondents thought AI guidelines should help with. This was based on a multi-select, multi-choice question with eight options (including 'other'). It is notable that the top two responses are about students wanting to know the boundaries of AI use in learning. The responses to the 'other' option included: knowing how AI works, being guided on the potential impact of putting data into AI tools, which AI websites are reputable and can be safely used, a process to accept feedback and questions, a clear distinction between acceptable use and plagiarism (if such a thing is possible), selection of tools, prompt engineering, and evaluating outputs.

Table 3 Capabilities that respondents think AI guidelines should help with

Position	**GenAI use**	**Count**
1	When using AI tools is inappropriate	24
2	Knowing how to reference the use of AI tools in work	23
3	How to identify what tasks can be delegated to AI and which you should do yourself in line with academic integrity requirements	22
4	Knowing what to use tools for	19
5	What to do if you are unsure about using AI tools for a given purpose	18
6	Knowing how to evaluate the outputs from AI	17
7	Choosing tools	17
8	Other	8

When asked how familiar they were with the current guidance and how useful they found it, all the respondents indicated they were at least aware of the current AI guidelines, but only seven indicated that they found them either useful or very useful. Respondents were positive about there being a guide, and that it was encouraging to see how it offered assistance in how to use AI tools critically, but there were several issues identified. One of the main shortcomings identified in the current guidance was that it was not detailed enough. Respondents indicated that it needed to take into account more advanced uses of AI tools, particularly in research, and to provide specific use cases to help students clarify how to use these tools in practice. Some also felt that the guidance was contradictory by giving permission to use AI tools but also saying they should not be used in some ways, without making the distinction clear enough for students to follow. To treat everyone fairly and consistently, the guidance

needs to provide much more explicit support. It was also suggested that the guidance on reporting of AI tool usage and related prompts was insufficient and unhelpful.

A series of Likert-scale questions about AI literacy revealed that the respondents were largely confident about many of these literacies. For example, 23 out of the 26 respondents strongly agreed that they were aware that AI tools could generate incorrect information, and 22 strongly agreed that they were aware that AI tools could generate biased information. 22 either agreed or strongly agreed that they always validated the information given to them by AI tools, and 21 either agreed or strongly agreed that they understood the basic principles of how AI tools work. However, only 13 were confident that they understood the capabilities of AI tools, and nine were not confident that they could apply AI across a range of tasks. Overall, the AI literacy questions suggested that there was strong knowledge of commonly discussed aspects of AI. However, more work may be needed to deepen awareness and understanding of the potential of AI's broader capabilities and limitations.

Answers to the open question "How would you define academic integrity in the age of AI?" provided a range of perspectives. These included honesty and transparency about AI Use, providing proper attribution about the use of AI, maintaining human critical thinking and judgment, using AI appropriately for the context, and maintaining an ethical approach. In response to the question "What do you think is the greatest risk of AI for education?", concerns included the erosion of critical thinking, lack of academic integrity, bias and misinformation, widening the digital divide, and students being overdependent on AI to the detriment of their intellectual development.

Of the 26 respondents, 11 indicated that they were willing to participate in the focus group. These were all invited to both focus group meetings.

Findings From the First Focus Group

Before the first focus group, the members were provided with a summary of the survey results as the focus material and asked to bring their interpretations and perspectives to the meeting. The key ideas that emerged from the discussion are outlined below, with reference to the relevant survey findings that underpinned the discussion.

1. Guidance on acceptable use, with practical examples

    Responses to the survey indicated that students may misuse AI tools due to vague or outdated guidance. The focus group discussed how certain uses (e.g., summarising, editing, using tools such as Grammarly to improve writing) fall into grey areas that can be problematic in deciding what is and is not an acceptable use. Therefore, guidance should clearly define what is acceptable versus problematic uses of AI and provide practical examples.

2. Promoting reflective practice, with exemplars

    Survey responses suggested that existing guidance regarding how students should document their AI use was inadequate. The focus group suggested that instead of just asking for certain actions to be reported, learners should be asked to reflect critically on how AI contributed to their work. Guidance should encourage reflective practices around AI use by providing examples of appropriate usage statements.

3. Avoiding excessive tracking/documentation

    Also relating to the current guidance on reporting AI use, requiring detailed logs of AI prompts or versions of work was felt by the group to be an unwelcome overhead. A corollary suggested here was a systematic literature review, where only the final research terms are reported, not every version. Any new guidance should focus on suggesting ways of meaningfully evidencing learning and personal AI literacy development, rather than requiring extensive documentation.

4. Developing AI literacy with support materials

    The focus group agreed that AI literacy is essential for both staff and students, covering knowledge and skills like prompt design, tool capabilities, and critical evaluation. The survey suggested that basic concepts of AI literacy were well understood by those who responded to the survey, but that some other literacies needed further development. The capabilities that respondents suggested AI guidelines should help with focused on AI literacies, such as the appropriate critical use of AI tools. It was suggested that guidance could support AI literacy development by having associated online modules or short workshops on AI literacy.

5. Encouraging the best use of AI for the individual learner/task

    Reflecting on the range of tools used by the survey respondents, the focus group indicated that students should be helped to use AI in ways that support their learning, based on their own strengths and goals. AI Guidance should therefore frame AI as a tool to complement student effort and capability appropriate to their learning needs.

6. Addressing ethical issues

    Based on some of the concerns raised in the survey about, for example, when it was safe to share data with an AI tool, students need to be aware that activities such as uploading copyrighted material into AI platforms raise privacy and legal issues. Guidance needs, therefore, to provide awareness of a range of ethical issues.

7. Preserving learners' independent thinking

    Building on the discussion around both students' individual learning and ethical concerns, the focus group noted that students may overuse AI, or start using it too early in a learning activity, undermining original thought. Guidance should therefore suggest ways for learners to balance their own thinking with AI-generated content and delay using AI when developing original ideas.

Summary of the First Focus Group Meeting

The focus group discussed the various ways that AI is being used by students, as indicated by the survey data, and how educators might respond constructively. Overall, it was believed that guidance should aim to support students with clear recommendations, relevant AI literacies, and good strategies for using AI in their own learning contexts, rather than trying to impose restrictive or unrealistic rules. The goal should be to identify core principles that remain relevant across tools and contexts. Guidance should be high-level and adaptable, focusing on ethical and educational values rather than restrictions. An evolving, student-centred approach that focuses on learning and integrity and is adaptive to change is therefore required.

Findings From the Second Focus Group

Before the second focus group, the members were provided with a summary of the discussion from the first focus group and asked to bring their further thoughts and ideas to the meeting. The key ideas that emerged from the discussion are outlined below, with reference, where relevant, to the findings from the first focus group.

1. Evidencing AI Use in Learning

    Building on the previous discussions relating to learners needing guidance about how to document their use of AI, there was a consensus that students should be able to explain how they used AI, particularly in tasks like literature reviews, in the interests of transparency and accountability. The group discussed how, in AI-supported work, both the product and the process are relevant. Given the problem discussed in the first focus group of recording every step of the process leading to excessive detail, a balance needs to be found. The group noted that educators should focus less on how students learn (AI-assisted or otherwise) and more on what they've learned. Therefore, rather than logging every AI interaction, participants suggested providing a few key examples of successful and unsuccessful applications as evidence to demonstrate where AI use was effective (or not), and reflecting critically on those examples. Linked to this discussion about the balance between process and product, there was also recognition that without understanding how AI was used, students may unintentionally undermine their learning by copying poor-quality or hallucinated content. Learning should show a positive shift in thinking or application. To support this, students need to be guided on how to demonstrate meaningful engagement and articulate their learning.

2. AI as a Learning Partner

    The focus group discussed how guidance should encourage the use of AI as a learning partner that can encourage curiosity and iterative thinking processes by supporting reflective dialogue. AI tools can help build students' confidence or teach them concepts, acting as informal tutors. There was interest in the idea that AI could recognise learning progress by analysing the sophistication of questions a student asks it. This might suggest that the support materials necessary to assist students in following the guidelines might include AI tools that can do this.

3. Digital Divides, Fairness, and Inclusion

    Discussion of ethical issues in the first focus group was centred on giving students guidance on ethical behaviour, but in the second session, broader ethical issues were discussed. There were concerns raised about the digital divide, with varying access to AI tools, raising equity issues if AI use is expected for learning but not universally supported. A different ethical question was whether there is a potential bias against AI as a learning tool - is AI unfairly held to a higher standard than human help (like asking a knowledgeable friend) when attempting to define what is ethical or not in learning from AI? There are also challenges in areas such as language translation, where AI can support students who speak English as a second language to write or speak in their native language, but the outcomes are written in English by AI, not the student.

4. Having Principles-Based Guidelines

The group favoured a principles-based approach over exhaustive lists of dos and don'ts. These principles might include areas such as transparency, critical engagement, and alignment with learning outcomes. Therefore, rather than initially trying to develop a full set of detailed guidelines, the first step should be a set of principles on which the final guidelines would be founded. However, this implies requiring high levels of AI literacy to work safely within the principles.

5. Developing AI Literacy

The group's members agreed that students should be developing their understanding of AI and its limitations, capabilities, and appropriate uses. One approach would be to use an AI literacy framework to let students assess and reflect on their own AI literacy throughout a course or project. Part of this literacy would include knowing when to use, or not use, AI.

6. Focusing on the Broader Purpose of Education

There was an acknowledgement in the meeting that AI is raising concerns about traditional academic structures and how they deliver and assess learning. Guidelines developed for students should seek to foster curiosity and idea development. There was agreement that guidance should focus on how we support student learning in the age of AI rather than on surveillance or sanctions. Guidelines should also be adaptable, reflecting the fast pace of change in AI and its impact on educational practices.

Summary of the Second Focus Group Meeting

Much of the discussion in the second focus group meeting extended the ideas and proposals from the first meeting. Again, the sentiment of the group was that we should not regard the use of AI in education as a threat to academic integrity, but as an opportunity to rethink how we learn, educate and assess. Rather than trying to create a set of rules, the focus should be on supporting meaningful, reflective, and equitable learning experiences, with AI as one aspect of learning. A key outcome was that we should start by defining a core set of principles to underpin the creation of the guidelines

Initial Outcome From the Co-Design Process

The initial outcome from the co-design process, as decided in the second focus group session, was to create a set of principles upon which future guidelines could be built and adapted over time.

From the data gathered from the survey and the focus groups, it was possible to identify a set of core principles that could be taken forward as the basis for future guidance for students using AI in their academic studies and for staff supporting them in this endeavour. These principles of AI guidance are based on a belief that guidance should start from the principle that developing AI literacy is the foundational enabler for other principles. Hence, all other principles follow from principle 1. Each of the following principles includes an indicative AI literacy competency from the SAIL framework that can be used to put that principle into a broader AI literacy context.

The proposed principles are that AI guidance will:

1. Support AI literacy development

    The guidelines should include explicit support for students in developing AI literacy, including associated learning resources such as online modules or short workshops to strengthen AI literacy skills.

2. Clearly define acceptable uses with practical examples

    Guidance should clearly distinguish acceptable from problematic AI uses, providing concrete examples to clarify grey areas.

    Related AI literacy - “Assess the implications of using AI for a specific purpose or context”

3. Promote reflective practice, supported by exemplars

    Students should be guided to critically reflect on their AI use rather than simply reporting it. Examples of appropriate reflective statements should be provided to guide learners in documenting meaningful aspects of their engagement with AI.

    Related AI literacy - “Identify the useful features of AI technologies when applied in specific contexts”

4. Have a balanced approach to documentation of AI use

    There should not be a requirement to track the details of all AI interactions. Rather, students should be encouraged to demonstrate their learning through selected, meaningful examples.

    Related AI literacy - “Demonstrate an understanding of AI's role in a specific situation”

5. Promote individualised use of AI

    Encourage students to use AI tools to complement their individual strengths and educational goals. The guidance should frame AI use as being supportive of personalised learning.

    Related AI literacy - “Apply AI tools in specific contexts to achieve personal, learning or work-based goals”

6. Foster ethical awareness

    Students need guidance on the ethical implications of AI use, including data privacy, intellectual property, fairness, and equity issues. As with other aspects, specific examples of scenarios that present ethical risks should be provided.

    Related AI literacy - “Identify risks presented by AI systems (e.g., security, personal data, privacy, fraud, cyber threats)”

7. Preserve independent thinking

    Guidance should give advice on how to balance personal, independent thinking with AI-generated content, limiting AI use to maintain originality and independent critical thinking skills.

    Related AI literacy - “Evaluate when the use, or non-use, of AI is suitable for different tasks”

8. Promote transparency in evidence of AI Use

    Encourage students to be transparent about their AI use by explaining and critically reflecting upon how AI contributed to their learning outcomes, with meaningful evidence of AI's contribution to their work.

    Related AI literacy - "Demonstrate responsible and safe behaviours toward AI and the threats it poses through misuse"

9. Regard AI as a learning partner

    Position AI as an interactive partner in learning, supporting reflective and iterative thinking. Encourage students to use AI to explore, deepen understanding, and build confidence in their learning processes.

    Related AI literacy - "Explain how users can interact with AI systems, including natural language"

10. Address digital divides and inclusion

    Recognise that inequities exist in AI access and capabilities among students and ensure that the guidelines themselves do not contribute to digital divides or exclusion.

    Related AI literacy - "Identify ways to mitigate the risks presented by AI systems"

CONCLUSION, IMPLICATIONS AND SUGGESTIONS

The outcomes of the co-design process so far have been to create a set of principles upon which a full set of AI guidelines can be developed through further co-design activities. In addition, the guidelines will need to be supplemented by various support materials that might include AI literacy framework materials, supporting examples, use cases and exemplars, and AI tools. The next stage of the process is to involve external advisors and educators associated with the organisation to discuss how to develop these principles and continue to refine the draft guidelines through feedback loops. Throughout the whole process, student voices will remain central in shaping policies that affect their learning.

Limitations of the Study

The study has a number of limitations. It is based in one institution and has engaged a small subset of the various stakeholder groups that may be impacted by changes to the institution's AI guidelines. Additionally, those stakeholders engaged in the survey and focus group processes were self-selecting. It is possible that the ideas developed from the study so far are not representative of the beliefs and wishes of the broader learning community. However, the work completed so far will enable a wider consultation to take place and for further feedback to be gathered. Similar challenges impact the generalisability of the study. However, it is suggested that the processes and principles applied in this particular study may be informative for other institutions engaging in similar co-design processes with their own stakeholder groups

Future Work

So far, the process of developing a new set of AI guidelines is incomplete and a range of additional stages are planned. A wider consultation on the principles will take place, followed by further

development of the detail of the guidelines themselves and additional supporting materials based on the principles and related AI literacies. The creation of a new set of AI guidelines is seen as an ongoing process that will need to be continually revisited as the features, capabilities, and challenges of AI tools continue to evolve.

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Assessment of Vocational Education on Online, Distance, Flexible Learning Environments: A Scoping Review

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ABSTRACT

This paper reports on a review of international literature from 2000 to 2025 on assessment practices in Technical and Vocational Education and Training (TVET) in online, distance, and flexible learning (ODFL) environments. Drawing on the PRISMA framework for systematic reviews, we identify and synthesise assessment types and assessment production models in the literature across a wide range of international environments including Africa, Australia, Europe and South America. The findings indicate that performance- and competency-based approaches are most common in ODFL TVET assessment, followed by online tests and quizzes, workplace-integrated assessments, self-assessments, portfolio-based assessments, and rubric-based assessments. Factors that shape the institutions' choices of assessment types include assessment purpose, subject area, course level, delivery mode, and technological advancements. The study also identifies some macro approaches to assessment production. The dominance of competency-based models reflects TVET's practical focus and industry-aligned orientation. Collaborative, formative, and quality assurance models balance stakeholder engagement and ongoing learning, while evidence-centred design ensures rigorous development. While the disaggregated model also receives research attention, it is mainly concerned with scalability, consistency, and cost-efficiency rather than learner engagement. Insights obtained from this systematic scoping review will be useful for curriculum design, quality assurance, and policy development, offering actionable recommendations for educators and administrators committed to advancing vocational education.

Keywords
vocational assessment; online learning; distance education; flexible learning; industry alignment

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INTRODUCTION

Technical and Vocational Education and Training (TVET) is a vital component of higher education, equipping learners with industry-relevant skills for diverse occupational fields (Cox & Prestridge, 2020). As TVET expands globally, the shift towards online, distance, and flexible learning (ODFL) environments has accelerated, particularly in response to economic disruptions such as those triggered by the Covid-19 pandemic. In New Zealand, for instance, job losses and an economic downturn have driven increased enrolments in distance TVET as adults seek to retrain or upskill from home. This trend underscores the need for assessments that are valid, reliable, practical, and fair in remote settings (Cedefop, 2022). This systematic scoping review examines international literature from 2000 to 2025 on TVET assessment in ODFL contexts, focusing on assessment types, production models, and key challenges.

Unlike in other higher education sectors, assessment in TVET, ODFL environments remains under-researched, with few systematic reviews addressing its unique demands. Existing reviews such as those by Lasen et al. (2018), Yusop et al. (2022), and Mphahlele (2024), explore work-integrated learning, general TVET assessment, or collaborative assessment, respectively, but do not specifically target distance delivery. This review fills this gap by investigating how providers design, deliver, mark, and provide feedback on assessments in ODFL settings. It highlights the complexities of ensuring authenticity and fairness in remote assessments, particularly with challenges such as generative AI and the need for personalised feedback. By synthesising global practices, this study aims to inform TVET providers on effective assessment strategies and identify areas for future research to enhance learner outcomes and industry relevance.

METHODOLOGY

This review addresses two research questions:

1) What types of assessment are used by providers of distance, vocational, higher education?
2) Which models of assessment production are used by providers of distance, vocational, higher education?

The two questions were searched separately. The researchers followed a systematic data collection and review process according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) system (Page et al., 2021). The search was restricted to articles published in English. The timeframe was 25 years, covering the period of publications from 2000–2025.

To identify relevant studies for the research questions, two literature searches were conducted, and later combined. The first search was conducted in the Google, Google Scholar, Proquest and EBSCO suite of databases, including Education Source Complete and ERIC. The search limits were “Worldwide Literature” and Boolean search strategies were used on keywords and search strings as follows:

1) “types of assessment” OR “methods of assessment” OR “assessment formation” AND "vocational education” OR polytech* AND distance education OR distance providers
2) “assessment model" OR "assessment design" OR "model of assessment production" AND disaggregated "vocational education" OR polytech* (OR university OR tertiary) AND distance education OR distance providers

Titles and abstracts were used to screen for relevance. These techniques yielded a total of 33 articles published between 2000 and 2025. A further relevant article was sourced by an author. All 34 were

read in full. Of these, 25 were eligible and 9 were discounted because any mention of assessment was tangential while the articles' main focus was on other aspects such as distance teaching pedagogy, design of programmes or curriculum, or the effects of the Covid pandemic on TVET teaching and learning. These nine articles have not been included in the references for this paper.

The second search was done using the Scopus database. The same keywords and search strings did not produce any results in Scopus, so the keywords were slightly altered:

1) "types of assessment" OR "methods of assessment" AND "vocational education" OR "distance education" OR "distance providers"
2) "assessment model" OR "assessment design" OR "model of assessment production" AND "vocational education" OR "distance education" OR "distance providers"

The initial search for the first research question produced 35 documents. This number was reduced to 27 after the time frame was limited to 2000-2025. We then removed all conference papers and books and retained 19 articles and 1 review. Restricting to publications in English removed 1 more publication. The number was further reduced to 14 after irrelevant documents were removed. These 5 removed articles included topics such as evaluating library support or use of the semester system.

The search on the second research question followed a similar process. The initial search resulted in 57 documents. This was reduced to 55 when the timeframe was applied. Seventeen (17) conference papers were then removed. After removing 1 non-English publication and 1 retracted article, the remaining number came to 36. We then reviewed the papers and removed 20 irrelevant ones. These included topics such as describing a particular assessment tool, other vocational education research, evaluating a programme or the teaching effects of distance/vocational education, introducing a new course, assessment of training needs, or risk assessment. Thus, the final number from the Scopus search of Research Question 2 resulted in 16 documents.

As a last step, results from the two database searches were combined to create the final corpus of publications for each of the two research questions. The corpus for Research Question 1 contains 26 entries about types of assessment. These are marked by * in the reference list at the end of this article. The corpus for Research Question 2 also contains 26 entries, marked by ** in the reference list. These are publications about the macro approaches/models of assessment of TVET in ODFL contexts. All remaining entries at this stage were able to be retrieved either online or via our two institutions' libraries. We then carefully read each publication and synthesised patterns and themes to answer the two research questions.

FINDINGS

Assessment Types

This section summarises answers to Research Question 1. We synthesise findings from the list of 26 articles identified, focusing on assessment types in vocational education across ODFL environments. Seven (7) of the 26 articles are review articles that provide foundational frameworks and syntheses, while the rest (n=19) are empirical studies that offer practical evidence, testing implementations in real settings such as nursing, agriculture, and engineering. These studies highlight the shift from traditional paper-based methods to digital, competency-oriented, and authentic approaches, driven by technological advancements and challenges like the COVID-19 pandemic. Key themes include the

integration of multimedia, the emphasis on competency-based education (CBE), and the need for assessments that promote equity, feedback, and skill development.

The articles collectively identify diverse assessment types, adapted for ODFL vocational contexts to measure skills, competencies, and knowledge. These are summarised in the table below, with tallies indicating the number of articles mentioning each type (some articles mention multiple), and examples drawn from the studies.

Table 1. Types of assessment in TVET

Assessment Type	Tally	Examples
Performance- Based Assessments	8	MBPA using multimedia simulations (de Klerk et al., 2014; de Klerk et al., 2018); performance criteria in nursing (Fastré et al., 2014); standards- referenced with rubrics (Griffin et al., 2007); authentic in CBET (Rahman et al., 2014); developmental performance evaluation (Tillema, 2003; Zhan & Zhang, 2011); action-based multimodal (Vasilev, 2024).
Competency- Based Assessments	7	Competency criteria vs. performance-based (Fastré et al., 2014); standards-referenced for competence (Griffin et al., 2007); authentic for micro-credentials (Patterson & Hepburn, 2025); CBET in vocational colleges (Rahman et al., 2014); interprofessional outcomes (Rogers et al., 2017); EBP tools (Tilson et al., 2011); domains/indicators in TVET (Yusop et al., 2023).
Online Tests and Quizzes	6	Web-based exams for mass evaluation (Abass et al., 2017); remote e- exams during pandemics (Elsalem et al., 2021); subtests for psychomotor skills (Huľová et al., 2024); self-evaluation and summative quizzes in accounting (Parte & Mellado, 2022); alternatives to rote testing in CIS courses (Serwatka, 2003); content-valid assessments for knowledge/skills (Suhaini et al., 2021).
Workplace-Integrated Assessments	5	Practical sessions in agriculture (Islam, 2008); WIL design with partner involvement (Lasen et al., 2018); placement tools in dietetics (Lennie & Juwah, 2010); interprofessional in health (Rogers et al., 2017); workplace-based portfolios/appraisals (Scholtz, 2020).
Reflective and Self-Assessments	4	Reflections on critical incidents in log journals (Amhag, 2020); self- evaluation quizzes (Parte & Mellado, 2022); student-directed developmental (Tillema, 2003); self-assessment in ABA (Vasilev, 2024).
Portfolio-Based Assessments	4	E-portfolios in environmental education (Makokotlela, 2020); portfolios for WIL (Lasen et al., 2018; Scholtz, 2020); performance appraisals in workplaces (Scholtz, 2020).
Rubric-Based Assessments	3	Rubrics in standards-referenced (Griffin et al., 2007); rubrics for e- learning consistency (Muktiarni et al., 2020); classification rubrics for EBP (Tilson et al., 2011).

Predominant Assessment Types

Table 1 shows that performance-based assessments are among the most prevalent in TVET, frequently cited in research for their emphasis on practical skill demonstration. Learners create a product or perform tasks, often individually or collaboratively, in fields such as engineering and nursing where real- world application is critical (Bateman et al., 2015; Muktiarni et al., 2020; Rahman et al., 2014). These assessments often incorporate multimedia or simulations, such as Multimedia-Based Performance Assessments (MBPA), to replicate workplace environments, ensuring authenticity (Zhan & Zhang, 2011). De Souza and Amante (2020) distinguish performance-based methods from those evaluating declarative knowledge. They argue that producing tangible outputs is essential for assessing competencies.

Competency-based assessments are equally prominent. They focus on meeting occupational standards, with portfolios and activity-based assessments (ABA) being common approaches (Suhaini et al., 2021; Yusop et al., 2022). Portfolios compile diverse evidence, including videos and photographs, to demonstrate achievement of learning outcomes (Zhan & Zhang, 2011). Activity-based assessments involve hands-on tasks in workplace settings, offering high face validity as learners recognise their relevance to future careers (Vasilev, 2024). These methods enhance engagement, job readiness, and employer satisfaction. Yusop et al. (2022), in particular, advocate the inclusion of career-adaptability skills to prepare learners for the fourth industrial revolution.

Online tests and quizzes are widely used in distance TVET for their scalability and instant feedback, especially in online and blended settings (Hyde et al., 2004). Comprising multiple-choice, true/false, or short-answer questions, they serve both formative and summative purposes. However, concerns about dishonesty (Elsalem et al., 2021) and their inadequacy for assessing practical skills (Islam, 2008) limit their effectiveness. Despite these drawbacks, their ease of design and automation makes them a practical choice for assessing theoretical knowledge.

Workplace-integrated assessments embed learning and evaluation within real or simulated workplace environments, aligning with flexible learning models (Lennie & Juwah, 2010). Bosco and Ferns' (2014) Authentic Assessment Framework (AAF) emphasises active engagement, high-level cognitive processes (e.g. creating, analysing), self-evaluation, and industry mentor involvement for effective work-integrated learning (WIL) assessments (Lasen et al., 2018). Challenges include variability across workplace sites and the need for careful placement to ensure relevant learning opportunities (Scholtz, 2020). While computer-supported simulations are effective, they cannot fully replicate the fluidity of real workplaces (Zhan & Zhang, 2011).

Reflective and self-assessments encourage learner agency by prompting students to evaluate their own performance, often through logbooks or journals (Amhag, 2020). These methods are most effective when paired with active tasks and supported by teacher guidance to ensure meaningful reflection (Scholtz, 2020). Similarly, the versatility of portfolios in compiling evidence of competency allows them to support both process and product evaluation, and foster autonomy in distance learning contexts (Zhan & Zhang, 2011).

In addition, some courses employ a range of assessment methods, including assignments, automated tests, demonstrations, essays, interviews, portfolios, practicums, proctored exams, reflective journals, and workplace assessments with employer involvement to recognise prior learning (Conrad et al.,

2013). This diversity ensures flexibility in recognising existing competencies, particularly for non-traditional learners.

Marking rubrics, though less common in the literature, provide structured criteria for consistent evaluation, with their under-representation suggesting a need for greater standardisation (Bateman et al., 2015). Collaborative assessments, such as peer feedback and group tasks, enhance engagement, motivation, and critical thinking while fostering a sense of community (Mphahlele, 2024). De Souza and Amante (2020) advocate their use alongside self-assessments and portfolios to increase learner responsibility. However, challenges include managing equitable participation and evaluating individual contributions.

Factors Influencing Assessment Choice

The choice of assessment types in distance TVET is driven by several key factors. The purpose of the assessment is critical: formative assessments, such as reflective tools, support ongoing feedback (Amhag, 2020; Tillema, 2003), while summative assessments, like quizzes or exams, are used for certification (Abass et al., 2017; Elsalem et al., 2021). Subject area shapes selection, with technical fields like engineering and agriculture favouring multimedia or performance-based tasks for psychomotor skills (Huľová et al., 2024; Islam, 2008), health professions prioritising interprofessional or WIL assessments (Rogers et al., 2017), and computing leaning towards online alternatives (Serwatka, 2003).

Course level also plays a role. Introductory courses use quizzes for foundational knowledge (Parte & Mellado, 2022), while advanced or placement-based courses opt for portfolios or authentic tasks (Makokotlela, 2020). Specific learning outcomes dictate alignment, with cognitive outcomes suited to quizzes, psychomotor to performance simulations, and affective to reflections (Amhag, 2020; Vasilev, 2024; Yusop et al., 2022). Ease of design, administration, and marking is crucial in distance contexts, where rubrics streamline grading (Muktiarni et al., 2020) and online exams reduce workload through automation (Abass et al., 2017). However, challenges like dishonesty or connectivity issues favour simpler methods (Elsalem et al., 2021).

Institutional factors, such as resources and staff training, can limit student-centred approaches (Cox & Prestridge, 2020), while regulatory demands for competence drive standardised methods (Rahman et al., 2014). The availability of workplace assessors and the need to ensure student authorship further influence decisions (Hyde et al., 2004). Technology enables innovative assessments but raises equity concerns in flexible environments.

Trends and Challenges

Since 2010, TVET assessments have shifted towards hybrid, student-centred methods, influenced by technological advancements and pandemics. Multimedia and simulations have become integral, particularly in performance- and competency-based assessments. However, challenges include variability in workplace assessments, cheating in online tests, resource demands of portfolios and reflective assessments, and the limitations of simulations in replicating real-world dynamics (Elsalem et al., 2021; Lennie & Juwah, 2010; Scholtz, 2020).

The Case for Mixed Assessment Methods

Mixed assessment methods provide a more reliable and comprehensive evaluation of learner competency (Ewing, 2017). Combining formative tools, such as self-check quizzes, with summative

methods like performance tasks and portfolios, ensures validity and industry confidence (Bateman et al., 2015). Ewing's (2017) study with indigenous Australian learners highlighted the limitations of single methods and advocated a holistic approach. The move away from traditional examinations towards diverse evidence-collection methods reflects TVET's practical focus (Cedefop, 2022).

Summary

Distance TVET assessments prioritise the evaluation of practical, workplace-relevant skills, while also taking account of learner engagement and scalability. Performance- and competency-based assessments lead due to their authenticity and alignment with workplace demands, supported by portfolios, simulations, and workplace-integrated tasks. Online tests offer efficiency but are of limited use for measuring practical skills. Workplace-integrated assessments and portfolios address diverse needs, while reflective and collaborative assessments enhance autonomy and flexibility. Assessment purpose, subject area, course level, learning outcomes and delivery mode are factors which shape the choice of assessment type, with the use of mixed methods ensuring comprehensive, fair and valid evaluation. Technological advancements drive hybrid approaches, although challenges such as dishonesty and variability in workplace assessments due to so many different types of competencies to be assessed, persist, underscoring the need for balanced, learner-centred assessment strategies.

Assessment Production Models

The following review addresses Research Question 2: "Which models of assessment production are used by providers of distance tertiary-level vocational education?"

TVET providers rely on different macro approaches to assessment production, which encompass the strategies providers use to design, deliver, mark, and provide feedback on assessments. These models integrate assessment with curriculum, involve stakeholders such as educators, learners, industry partners, and institutions, and address management processes including quality assurance and resource allocation.

Twenty-six (26) studies from 2000 to 2025 are analysed to identify key approaches to assessment. Next, we present a table summarising these models (Table 2), followed by insights into trends and gaps.

Major Assessment Production Models

Table 2 summarises the major assessment models. Studies primarily focused on each model (with overlaps) are tallied, followed by examples.

Table 2. Models of assessment production

Model	Tally	Examples
Competency-Based	12	Digital authentic assessment in internships (Efendi et al., 2025); CBA for micro-credentials (Patterson & Hepburn, 2025); transparent competency process with PrACT (De Souza & Amante, 2020)
Collaborative/Participatory	5	Speculative design for remote integrity (Carbonel et al., 2025); workflow digital portfolio (Staccini et al., 2007); asynchronous participatory exams (Wu et al., 2010)

Formative	4	E-assessment for skills in computing (Hettiarachchi et al., 2015); assessment for learning in writing modules (Strauss & Mooney, 2017); integrated feedback framework (Yunus, 2025)
Quality Assurance	4	Global qualification assurance (Bateman et al., 2015); analytical framework for IVET trends (Cedefop, 2022); institutional model for distance education (Giorgetti et al., 2013)
Unbundled/Disaggregated	3	OERu consortium for OER accreditation (Conrad et al., 2013); tailored employer assessments (Hyde et al., 2004)
Evidence-Centred Design	2	ECgD for diagnostic intrapreneurship (Bley, 2017); framework for MBPA (de Klerk et al., 2018)

We note the prevalence of competency-based models in Table 2. This reflects TVET's practical focus, with 12 studies emphasising industry-aligned assessments. Collaborative, formative, and quality assurance models balance stakeholder engagement and ongoing learning, while unbundled models, though less frequent, gain traction for scalability, as seen in three studies. Evidence-centred design ensures rigorous development. Next, we explore the major models one by one.

Macro Approaches to Assessment Production

Competency-Based Models

Competency-based models dominate the corpus, appearing in 12 studies, reflecting TVET's focus on industry-relevant skills and specific learning outcomes. These models embed assessments within the curriculum, often incorporating generic skills like numeracy or entrepreneurship into training packages or courses. Stakeholders, including employers and tutors, are central to validation and moderation, ensuring that assessments align with real-world competencies. For example, Yusop et al. (2022) advocate mixed methods for reliability in TVET assessments, while Patterson and Hepburn (2025) apply competency-based approaches to micro-credentials, using backward design to verify employability skills through authentic tasks. Efendi et al. (2025) leverage mobile technologies to foster lifelong skills and develop a digital authentic assessment model for vocational internships. Similarly, Jubaedah et al. (2022) implement a digital competency-based model for practical skills like turndown service in the hospitality industry. These practical skills involve internal and external assessors for moderation.

Morselli (2024) examines entrepreneurship competence in Italian VET, noting gaps in learner involvement despite using formative and summative components with rubrics. Clayton et al.'s (2003) trainers manage design and certification and explore embedding generic skills in accredited courses. Bateman et al. (2015) frame global competency-based quality assurance and link outcomes to labour market trust. Ewing (2017) trials diagnostic, scenario-based, and simulated assessments for Indigenous learners, and advocates holistic approaches for comprehensive competency evaluation. Sofyan et al. (2024) highlight fair assessment in Indonesian vocational higher education, balancing teacher and student roles in decision-making. Tidake et al. (2024) innovate with machine learning, and use federated LSTM for personalised skill assessment. De Souza and Amante (2020) encourage co-participation in criteria definition for online technical courses in order to promote transparency via their PrACT model. Bley (2017) employs Q-matrices for skill-task alignment and uses evidence-centred game design to validate diagnostic assessments.

Collaborative and Participatory Models

Collaborative and participatory models emphasise stakeholder partnerships, often leveraging digital tools for shared management. Wu et al. (2010) describe asynchronous participatory examinations, where students contribute to exam creation, solving, and grading, which foster acceptance through perceived learning and enjoyment. Mphahlele (2024) reviews collaborative assessments in open distance e-learning and addresses challenges like group dynamics through social constructivism. Carbonel et al. (2025) use speculative design workshops with teachers, students, and leaders to reimagine remote assessments. O'Reilly (2004) advocates transdisciplinary partnerships by involving learning designers and academic staff from various disciplines to create online assessments. Staccini et al. (2007) present a workflow-oriented digital portfolio model for nationwide blood transfusion practices evaluation and integrate business process modelling to manage physician enrolment and follow-up.

Formative Assessment Models

Formative assessment models prioritise ongoing feedback and learner engagement to integrate assessment into the learning process. Hettiarachchi et al. (2015) develop an e-assessment system for computer engineering, so as to support skill acquisition through interactive environments and automated tracking. Strauss and Mooney (2017) focus on assessment for learning in postgraduate vocational modules to engage diverse students through buy-in strategies. Yunus (2025) proposes an integrated e-learning framework at Universitas Terbuka, which blends formative low-stakes tasks with hybrid synchronous-asynchronous formats to promote equity. Hyde et al. (2004) note diverse methods in flexible delivery, influenced by assessor availability and authorship verification.

Quality Assurance Models

Quality assurance models of assessment in TVET employ institution-wide strategies to evaluate programmes comprehensively. According to Bateman et al. (2015), global quality assurance frameworks for qualifications involve stakeholders to foster trust and credibility in the labour market. Cedefop (2022) examines trends in initial vocational education assessments, applying an analytical framework to address epistemological challenges and connections to lifelong learning. At an Argentine university, Giorgetti et al. (2013) propose a model tailored for distance education, which evaluates both student achievement and the contextual relevance of teaching strategies. Similarly, Lockhart and Lacy (2002) present a seven-part model for distance education programmes, encompassing institutional preparedness, faculty support, and student retention strategies through an assessment lens.

Unbundled/Disaggregated Models

Unbundled models are less common. They offer separation of learning from assessment and accreditation, potentially enabling cost-effective pathways for informal learners. Conrad et al. (2013) investigate the OERu consortium, where institutions collaborate to accredit open educational resource (OER)-based learning. Gilmore and Nguyen (2023) explore unbundling teaching from marking and course design. They emphasise impacts of the model on teachers, students, and cost-effectiveness. Hyde et al. (2004) identify unbundled approaches in Australian TVET, including assessments tailored to future employers or purchased as ready-made packages, though institutions retain responsibility for applying assessment principles.

Evidence-Centred Design Models

Evidence-centred design models provide structured frameworks for assessment development, particularly in technology-enhanced contexts. Bley (2017) applies this approach to diagnostic assessments of intrapreneurship competence. Expert and learner data are triangulated to refine skills, tasks, and interpretations. De Klerk et al. (2018) propose a framework for multimedia-based performance assessment, combining literature reviews and expert consultations to guide iterative design in vocational settings.

Summary

Since 2015, TVET assessment models have shifted towards competency-based and technology-integrated approaches, driven by digital advancements and pandemics, with increased focus on authenticity and collaboration. Unbundled models offer scalability but require financial sustainability. Formative and participatory models enhance engagement yet demand educator training. Quality assurance and evidence-centred design ensure validity but face challenges in standardisation. Hyde et al. (2004) note collaborative design with industry and tailored assessments, while O'Reilly (2004) highlights transdisciplinary partnerships led by learning designers. Gaps persist in empirical validation and equitable implementation, underscoring the need for robust guidelines to balance feasibility, integrity, and learner-centred outcomes in distance TVET.

DISCUSSION

This review has thus far charted the domain of TVET assessment and outlined major assessment types and assessment production models. In the next section, we highlight three main issues for discussion: the defining characteristics of TVET assessment, the disaggregation and unbundling approach to assessment, and the challenges to be faced in aligning TVET assessment in ODFL contexts.

Defining Features of TVET Assessment

TVET in ODFL environments is designed to deliver practical, industry-relevant skills tailored to diverse occupational fields. Its defining features, namely accessibility, learner-centred flexibility, technology integration, industry alignment, competency-based outcomes, third-party involvement, national standards, recognition of prior learning (RPL), and generic skills, shape a system that prioritises employability and lifelong learning. Assessments in these settings must align with these characteristics in order to ensure authenticity, flexibility, and stakeholder collaboration while addressing challenges like integrity and equitable access.

A cornerstone of ODFL delivery is accessibility, as it enables individuals from diverse geographical and socio-economic backgrounds to pursue education free from the limitations of traditional classrooms. In Indonesia, Universitas Terbuka's scalable e-learning framework overcomes geographical barriers, ensuring equitable access (Yunus, 2025). Flexibility caters to non-traditional learners, such as working adults, through modular curricula and hybrid delivery blending synchronous and asynchronous methods which support lifelong learning and professional growth (Bateman et al., 2015). Technology underpins interactivity, with digital platforms, multimedia, and simulations enhancing skill development. For instance, de Klerk et al. (2018) highlight multimedia-based performance assessments (MBPA) that mirror workplace scenarios in engineering and hospitality. Industry alignment anchors training to occupational standards via employer partnerships, as evidenced by Hyde et al.'s (2004) findings in Australian TVET. Competency-based outcomes prioritise measurable skills,

such as intrapreneurship or hospitality tasks, over theoretical knowledge (Bley, 2017; Jubaedah et al., 2022).

TVET's focus on practical application sets it apart from other higher education sectors, demanding assessments that evaluate skills in real-world contexts (Cedefop, 2022). Dominant competency-based models embed assessments within curricula to measure specific outcomes. Yusop et al. (2022) endorse mixed methods like portfolios for reliability, while Patterson and Hepburn (2025) apply backward design to verify employability skills in micro-credentials. Efendi and Wulandari (2025) utilise mobile technologies for authentic internship assessments, fostering lifelong skills, and Jubaedah et al. (2022) employ digital models with dual assessors for hospitality competencies. The PrACT model by de Souza and Amante (2020) promotes transparency by involving learners in criteria development, boosting engagement.

Workplace-based assessments are integral to TVET's real-world focus. This model gains credibility through employer involvement in evaluating core tasks (Cedefop, 2022). Bosco and Ferns' (2014) framework advocates active engagement, complex cognitive tasks, and industry mentor input, although Scholtz (2020) stresses careful site selection for educative placements. Simulations offer controlled skill evaluation but may lack workplace nuance (Zhan & Zhang, 2011). Digital portfolios, as used by Staccini et al. (2007), compile evidence for comprehensive assessment.

Third-party involvement, including workplace supervisors and learners via self- and peer-assessments, defines TVET's collaborative ethos (Cedefop, 2022; Hyde et al., 2004). National standards in countries like Australia ensure rigorous benchmarks, often set by professional bodies (Bateman et al., 2015). Flexible pathways like RPL and credit transfer validate prior experience (Conrad et al., 2013). Generic or transversal skills such as communication remain under-assessed, prompting calls for national frameworks (Clayton et al., 2003). Rising costs for digitalisation and compliance challenge providers (Bateman et al., 2015).

To align with diverse delivery modes, assessments must be flexible. Hettiarachchi et al. (2015) advocate formative e-assessments for ongoing feedback, while Yunus (2025) prioritises low-stakes tasks to enhance autonomy. Collaborative assessments foster engagement but require careful oversight (Mphahlele, 2024). Technology, while enhancing delivery, raises integrity and access issues. This is addressed by speculative design (Carbonel et al., 2025) and machine learning innovations (Tidake et al., 2024). Industry partnerships and transdisciplinary teams ensure relevance (Hyde et al., 2004; O'Reilly, 2004). Quality assurance, bolstered by marking rubrics and institutional frameworks, can maintain reliability despite workplace variability (Giorgetti et al., 2013; Morselli, 2024). Mixed methods offer holistic evaluation (Ewing, 2017).

In summary, just as vocational teaching and learning in ODFL environments thrive on accessibility, flexibility, technology, industry alignment, and competency focus, so too should TVET distance assessments be aligned through technology-supported, authentic, and collaborative approaches to address challenges in integrity and access so as to prepare learners for future success.

Disaggregation and Unbundling in Vocational ODFL

In vocational education delivered through ODFL environments, the concepts of disaggregation and unbundling refer to the separation of traditionally integrated educational functions, specifically the splitting of course design, teaching, assessment, and accreditation into distinct, often outsourced

components. This model challenges the conventional notion of a single educator responsible for all aspects of a course, instead promoting a modular, team-based approach to education delivery.

Unbundling typically involves decoupling teaching from assessment, as seen in models where faculty focus on mentoring and content delivery while trained assessors or external markers handle grading. McLane, Galbraith, and Robison (2022) describe such a system at BYU-Idaho Online, where faculty are freed from grading responsibilities to enable greater student engagement and job satisfaction. Similarly, Gilmore and Nguyen (2023) explore unbundling in Australian higher education, where roles are distributed among instructional designers, online facilitators, and assessment specialists, enhancing efficiency and consistency.

Another form of unbundling is exemplified by the OER University (OERu) consortium, as detailed by Conrad et al. (2013). Here, learners access free open educational resources (OER) for study but pay only for formal assessment and accreditation. This model decouples learning from certification, expanding access to education while maintaining quality assurance through formal evaluation processes.

The primary purposes of unbundling are to improve scalability, consistency, and cost-efficiency in assessment, particularly in large-scale ODFL programmes. It allows institutions to standardise marking, reduce instructor workload, and provide faster, more reliable feedback. Moreover, it supports learner autonomy by enabling flexible, self-paced study without sacrificing credential validity.

Key benefits include greater assessment reliability, faster turnaround times, and improved instructor satisfaction, as educators can focus on pedagogical support rather than administrative marking. It also facilitates specialisation, with assessors trained specifically in competency-based evaluation, thus enhancing fairness and transparency.

However, unbundling risks weakening the connection between teaching and assessment, potentially leading to misalignment in expectations. There are also concerns about equity, as learners may perceive paid assessment services as creating a two-tier system. Additionally, as Carbonel et al. (2025) caution, over-reliance on external or automated assessment may undermine learner motivation and relatedness, particularly if feedback lacks personalisation.

In sum, while unbundling offers advantages in efficiency and scalability for vocational ODFL, it requires careful design to maintain pedagogical coherence, equity, and learner engagement. Despite a few studies that point to the efficiency of this model, we caution policymakers to weigh carefully the pros and cons of unbundling. The big question we must ask ourselves is the purpose of adopting the model. Do benefits of efficiency and accountability outweigh the potential negative effects on student learning?

Challenges in Aligning Assessment in Distance TVET Environments

TVET in ODFL environments faces unique challenges in designing assessments that are valid, reliable, practical, and fair while aligning with a competency-based approach, incorporating industry input, and managing delivery, marking, and feedback remotely. These challenges include ensuring quality formative assessment, providing personalised and timely feedback, verifying student authorship, measuring performance through diverse evidence, accommodating group work, assessing higher-order skills, and addressing educators' unfamiliarity with educational frameworks (Hyde et al., 2004).

One of the most pressing challenges is embedding sufficient, high-quality formative assessment within course design to support learners studying remotely. Formative tasks, which provide ongoing feedback to enhance learning, are critical in ODFL settings where face-to-face interaction is absent. Hyde et al. (2004) emphasise that these tasks must be carefully integrated to guide learners toward competency without the benefit of immediate, in-person clarification. Closely related is the challenge of delivering personalised, constructive, and timely feedback. Writing effective feedback for remote learners is a specialised, time-consuming task, requiring markers to articulate clear, actionable insights without direct communication. Hyde et al. (2004) note that academic staff ideally should contact learners via phone or email for individualised support, but time constraints and large student cohorts often make this impractical. This lack of direct engagement limits the ability to tailor feedback to individual needs, potentially hindering learner progress and motivation in competency-based programmes.

Ensuring student authorship in distance TVET assessments presents another significant hurdle. Without face-to-face contact, educators struggle to become familiar with learners' writing styles or work patterns. In institutions employing adjunct markers who process submissions from an online queue, a single learner's work may be evaluated by several different people across a course, preventing markers from tracking progress or recognising inconsistencies. Anti-plagiarism software is widely used but struggles to keep pace with generative artificial intelligence (AI), which can produce sophisticated outputs that evade detection. Efforts to redesign assessments to confirm student identity and ensure competencies are met without unacceptable AI use are underway, but Hyde et al. (2004) note that these solutions are not yet scalable to meet the needs of large, diverse cohorts. This challenge threatens the validity and fairness of assessments, as providers must balance technological innovation with academic integrity.

Measuring learner performance through a mix of direct and indirect evidence is essential in distance TVET, given its focus on practical skills. Hyde et al. (2004) suggest using varied assessment types such as portfolios to capture both tangible outputs and process-oriented evidence, ensuring accessibility, and allowing learner choice in assessment location, such as workplace or simulated settings. Portfolios enable comprehensive evaluation by compiling diverse evidence, accommodating learners with varying access to resources. However, designing and evaluating these assessments remotely requires robust systems to maintain consistency and fairness across contexts. Administering group or pair work in ODFL settings adds further complexity. Collaborative tasks enhance engagement and critical thinking but are difficult to oversee remotely due to logistical issues like scheduling and ensuring equitable participation (Hyde et al., 2004). These challenges demand innovative digital tools and clear guidelines to facilitate effective collaboration.

Assessing higher-order skills, such as analysis and creation, poses a significant challenge in distance TVET, particularly at advanced course levels. Hyde et al. (2004) observe that multiple-choice or short-answer questions, often used in auto-marked assessments, are inadequate for evaluating complex cognitive processes. Designing tasks that measure these skills, such as case studies or project-based assessments, requires careful alignment with learning outcomes and industry expectations. However, creating and marking such assessments remotely increases the workload for educators and demands sophisticated platforms to ensure reliability. This is compounded by the need for assessments to reflect real-world applications, necessitating input from industry stakeholders to maintain relevance.

For some TVET educators, particularly those recruited from industry rather than educational backgrounds, a lack of familiarity with pedagogical concepts complicates assessment design and

implementation. Ewing (2017) highlights that some trainers struggle with interpreting and assessing competencies, as well as navigating learning outcomes, internal and external moderation, and national frameworks or unit standards. This gap in expertise can lead to inconsistent assessment practices, undermining validity and reliability. Professional development is crucial to equip these educators with the skills to design assessments that align with TVET's competency-based focus and meet regulatory standards, such as those set by national qualifications frameworks or professional bodies.

Addressing these challenges requires a multifaceted approach. Incorporating industry input ensures that assessments remain relevant to occupational standards, with employers contributing to design and validation. Digital tools, such as e-assessment systems and machine learning algorithms, can enhance feedback delivery and authorship verification, though equitable access and integrity concerns must be addressed. Mixed methods, combining formative tasks like self-check quizzes with summative assessments like portfolios, provide a holistic evaluation of competency (Ewing, 2017). Additionally, transdisciplinary partnerships (O'Reilly, 2004) can support educators in designing innovative assessments, fostering collaboration across academic disciplines.

In summary, distance TVET assessments face challenges in ensuring quality formative tasks, personalised feedback, student authorship, diverse evidence collection, collaborative work, higher-order skill evaluation, and educator familiarity with pedagogical frameworks. Solutions include industry collaboration, digital tools for feedback and integrity, mixed assessment methods, and professional development to align assessments with competency-based, industry-relevant outcomes, ensuring validity and fairness in ODFL contexts.

CONCLUSION

This systematic scoping review synthesised international literature from 2000 to 2025 on technical and vocational education and training (TVET) assessment in online, distance, and flexible learning (ODFL) environments. Twenty-six publications on assessment types and 26 on assessment production models were selected from major databases. The process was guided by the PRISMA framework. The findings underscore the distinct nature of TVET assessment, which prioritises practical competency over theoretical knowledge, aligning with industry demands through workplace-based evaluations and third- party involvement. Accessibility, flexibility, and technology integration define ODFL contexts, and necessitate assessments that are authentic, learner-centred, and adaptable to diverse delivery modes.

TVET assessments in ODFL settings focus on evaluating how learners apply skills in real-world contexts, often situated in workplaces to enhance authenticity and stakeholder trust (Cedefop, 2022). Employers and qualified assessors frequently participate, ensuring relevance to occupational standards, while learners increasingly engage in self- and peer-assessments to foster autonomy. National standards, driven by industry and professional bodies, shape assessment design, particularly in high-stakes fields like accounting and trades. Alternative pathways, such as recognition of prior learning (RPL) and credit transfer, are expanding, providing flexible routes to qualifications (Conrad et al., 2013). Generic, transversal skills, including communication and digital competence, are gaining attention, though Clayton et al. (2003) note challenges in the direct assessment of these. Rising financial investments in digital infrastructure and quality assurance reflect the sector's increasing regulatory demands (Bateman et al., 2015).

Significant challenges arise in delivering valid, reliable, practical, and fair assessments remotely. Providing sufficient formative tasks and personalised feedback is resource-intensive, particularly

without face-to-face interaction (Hyde et al., 2004). Ensuring student authorship amidst generative AI advancements remains a critical issue, with current anti-plagiarism tools and assessment redesigns struggling to scale effectively. Assessing higher-order skills and managing collaborative tasks remotely further complicate design and administration. Competency-based models dominate, incorporating performance-based, activity-based, and workplace-integrated assessments, often supported by digital portfolios and simulations (Yusop et al., 2022). Collaborative production models, ranging from partnerships with industry to transdisciplinary design teams, enhance relevance but require coordination (O'Reilly, 2004).

Cedefop (2022) identifies trends shaping TVET assessment, including increased formative assessment, digital tools, and alignment with learning outcomes, which are mirrored in New Zealand's TVET providers. However, gaps persist in understanding provider-specific assessment creation and learner experiences. Future research should explore case studies to compare assessment production models and evaluate their effectiveness across learning domains. The shift away from traditional essays towards interactive and invigilated assessments, driven by AI concerns, warrants further investigation to ensure academic integrity. Additionally, studies on learner perspectives regarding formative versus summative tasks and remote feedback could enhance assessment design and promote engagement and equity in distance TVET.

By embracing these challenges as opportunities, TVET providers can pioneer innovative, inclusive assessment practices that empower learners, bridge educational divides, and shape a skilled, adaptable workforce for the future.

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

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Self-Regulated Learning in Blended and Online Education within Learning Ecologies Framework

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ABSTRACT

Self-regulation of learning emerged after the pandemic as something that should be oriented and trained, as many of the students –and teachers- become lost because of the lack of self-regulation practices in a context in which time and space changed the nature of teaching and learning. On the other hand, the concept of Learning Ecologies (LE) has emerged as a valuable framework to analyse how people learn, and what decisions they make to do it. Learning Ecologies become a framework for identifying patterns in which different individuals and groups learn, both personally and professionally. In the context of the SuperRED project, a European partially funded project, a survey was conducted to explore the diverse learning ecologies of students from three educational institutions, each located in a different European country (Italy, Belgium and Catalonia). The main aim of the survey was to analyse learning practices, extracurricular activities, resource preferences and relationships among students. A descriptive quantitative methodology was employed to systematically collect and analyse data on the LE of students from the aforementioned institutions. The collected data were analysed using descriptive statistical techniques, including percentages and modes, to identify patterns and trends in students' responses. The findings of the survey provide a comprehensive view of how context shapes educational practices and student experiences across three educational institutions. As an outcome of this activity, a toolkit for self-regulation resources and tips was created and openly published.

Keywords

Self-regulation, Learning ecologies, Learning practices, Extracurricular activities, Motivation, Academic performance, Educational resources, Support interactions, Blended learning, Online learning

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INTRODUCTION AND LITERATURE

Learning ecologies, defined as the social, cultural, and material environments that influence the learning process, exhibit great diversity on a global scale (Amali et al., 2023). This research explores variations in learning ecologies based on the educational contexts of the different educational institutions analysed (Gonzalez-Sanmamed et al., 2020) in the participating countries of the SuperRED project: Catalonia, Italy, and Belgium (SuperRED, n.d.).

Learning extends beyond the acquisition of knowledge and skills; it develops within a complex and dynamic environment that significantly influences the process. This environment, referred to as a learning ecology, comprises social, cultural, and material factors that interact with one another, shaping students' learning experiences (Bronfenbrenner, 1979, Navarro & Tudge, 2022).

Barron (2006) describes learning ecologies as complex configurations of learning contexts, consisting of different experiences (activities and relationships) and resources. This concept highlights the multifaceted nature of learning environments, where multiple elements interact to influence educational outcomes.

Each context reflects its cultural and social values, leading to different learning ecologies. For instance, some schools emphasize traditional learning and individual study, while others promote a more constructivist and collaborative approach (Giersch et al., 2021). For some schools, academic excellence and preparation for higher education are primary objectives, whereas others value vocational skills training or the transmission of traditional cultural values (Spector & Park, 2017).

Access to educational technologies such as computers, the internet, and digital resources varies considerably between schools. These disparities can affect learning opportunities and the quality of education, as students' access to the internet and online educational resources impacts their educational experiences (Warschauer, 2019).

As an important element of these learning opportunities, technology enables the introduction of blended learning in schools which, while not ignoring the challenges of its proper implementation, proves to be an effective way to foster students' self-regulated learning (Prasse et al., 2024; Zimmerman, 2008;).

To conduct this research, a comprehensive survey was implemented to explore the diverse learning ecologies of students in the participating countries of the SuperRED project: Catalonia, Italy, and Belgium. The primary objective of the survey was to analyse potential variations in learning practices, extracurricular activity, resource preferences and relationships among students from three different European countries.

The main objective of this research is to analyze how activities carried out outside the school environment, in non-formal learning contexts, influence students' perception of their motivation and academic performance, considering the articulation between formal and non-formal learning, as well as the impact of these activities, the educational resources used, and the support interactions available to students.

This overall objective is specified in the following three research questions:

1. What impact do extracurricular activities (such as sports, arts, and cultural activities) have on students’ school motivation and academic performance?

2. What types of educational resources do students commonly use, and how do they evaluate their contribution to the learning process?
3. How do extracurricular activities, educational resources, and support interactions influence students' self-regulation of their learning?

The structure of this paper is organized to guide the reader through the research process, starting with the methodology. The methodology section follows, detailing the design of the survey and the processes involved in data collection. This section is crucial as it ensures the accuracy and relevance of the findings by explaining how data were systematically collected and analysed (Creswell & Creswell, 2022).

The results are then presented in a structured format, divided into sections on activities, resources, relationships, and a general overview. This structured approach allows for a more comprehensive understanding of the different elements of the students' learning ecologies. Each section provides knowledge into specific aspects of the students' learning ecologies, helping to identify patterns and differences across them. This discussion integrates the findings with existing literature.

Finally, the article concludes with a discussion of the results, highlighting their implications for educational practices and policies in the participating schools.

METHODS

For this study, a descriptive quantitative methodology was employed to systematically collect and analyse data on the learning ecologies of students from three schools located in Catalonia, Italy, and Belgium. This approach provides a comprehensive and detailed view of the behavioural patterns and preferences in extracurricular activities, resources, and relationships among the students examined. Descriptive quantitative research is effective in offering a broad overview of trends and correlations, allowing for the identification of patterns that may not be immediately evident through qualitative methods.

Descriptive research plays a crucial role in educational research, as it allows for the systematic observation and description of the characteristics and behaviours of a particular population without influencing or manipulating variables. This type of research is particularly valuable in educational settings, where controlling all extraneous variables is often impractical (Knupfer & McLellan, 2001). It helps in capturing the complexities of educational environments and student behaviours, thus providing valuable insights that can inform educational practices and policies (Cohen et al., 2018).

Several studies have highlighted the significance of descriptive quantitative methodologies in educational research. For instance, Creswell (2020) emphasized the importance of such methods in providing a detailed understanding of educational phenomena. Similarly, the *Handbook of Quantitative Methods for Educational Research* elaborates on various effective descriptive techniques that enhance the depth and reliability of educational research (Teo, 2014).

The primary instrument used in this study was a survey specifically designed to collect information about the educational contexts, extracurricular activities, resources used, and relationships of students in the participating schools in the SuperRED project: Escola SOLC (Catalonia), IC Ilaria Alpi di Sarzana (Italy), and Bernardusscholen (Belgium). The survey was developed based on existing academic literature on learning ecologies, underlining the importance of understanding different contexts to

improve pedagogical practices. In line with the SUPERRED project's focus, particular attention was also given to the concept of Self-Regulated Learning (SRL), which informed both the design of the survey and the interpretation of students' engagement across diverse learning environments.

The survey instrument was designed by reviewing and incorporating information from the academic literature on learning ecologies, as well as from activities held during the first Learning, Teaching, and Training Activity (LTTA) of the SuperRED project in Genoa. During this LTTA, teachers from the three participating schools collaborated to identify key aspects of students' learning ecologies that should be analyzed, and was validated by four experts in the field of educational technology and e-learning from the research group Edul@b at the Universitat Oberta de Catalunya. This collaborative effort ensured that the survey would be relevant and comprehensive.

The survey ensured that data collected would reflect the complex interactions of elements within learning ecologies, helping a more in-depth analysis of how these ecologies support student development (Barron, 2006; Siemens, 2005).

Additionally, Bronfenbrenner's (1979) ecological systems theory provides a useful framework for analysing the interactions between different learning environments. This theory points out the significance of different environmental systems in shaping the development of children and adolescents, being from immediate settings like family and school to wide-ranging societal influences. By incorporating these theoretical perspectives, the survey was designed to capture the complexity of learning ecologies and provide useful insights for improving educational practices.

Once the survey was validated, it was translated into the native languages of each country involved in the study, with the assistance of teachers participating in the project. This step was essential to ensure that the survey questions were not only semantically correct, but also culturally relevant and easy to understand for all the students. Research highlights the importance of culturally adapting instruments to maintain their validity and reliability across different populations (Beaton et al., 2000; Crunchinho et. al, 2024).

Descriptive statistical techniques are widely recognized for their ability to summarize and describe the basic features of data in a study, providing simple summaries about the sample and the measures (Loeb et al., 2017). These techniques help in revealing patterns that might not be apparent through qualitative analysis alone, making them particularly valuable in educational research (Cohen et al., 2018).

FINDINGS AND DISCUSSION

This research aims to provide a more profound understanding of students' learning ecologies and practices through a comparative analysis across the participating countries, offering a wider view of contemporary European educational contexts. By examining and comparing the learning environments, extracurricular activities, resource uses, and students' relationships in schools from different cultural and educational backgrounds, this study seeks to identify both specific and common elements that influence student learning and development.

Comparative educational research is essential for finding out how different educational infrastructures and contexts shape student experiences and outcomes (Wiseman, 2023). By providing detailed data into the learning ecologies of students in Catalonia, Italy, and Belgium, this research contributes to a

more comprehensive understanding of how educational practices and policies can be optimized across different educational contexts (Crossley & Watson, 2003).

Understanding these factors is crucial for developing strategies that address the specific needs of students in different European countries, promoting equity and excellence in education (OECD, 2018). The findings from this study can help teachers, policymakers, and researchers about the best practices and areas for improvement, finally improving educational performance at an international level.

Data was collected from students from the three schools participating in the SuperRED project. A total of 67 Catalan students, 17 Italian students, and 75 Belgian students answered the survey. Gender and age distribution in percentages by country are shown in Table 1:

Table 1. Sample by country, where 10/12 means "from 10 to 12 years old"

Sample in %	**Female**	**Male**	**Non binary**	**Other**	**10/12**	**12/14**	**14/16**	**16/18**
CATALONIA	47.80	49.30	1.50	1.50	0.00	19.40	64.20	16.40
ITALY	82.40	17.60	0.00	0.00	35.30	64.70	0.00	0.00
BELGIUM	38.70	60.00	1.30	0.00	5.30	88.00	6.70	0.00
TOTAL	47.19	50.94	1.24	0.63	6.27	56.58	30.20	6.91

The differences in gender and age distributions across the countries in the SuperRED project reflect the different demographic characteristics of the student samples. Catalonia's balanced gender distribution and older age range suggest a more balanced population in terms of both gender and age. In contrast, Italy's sample is mostly female and younger. Belgium's sample, with a higher proportion of younger students and a reasonably balanced gender distribution. The differences are due to the types of schools that participated, and the groups involved in the SuperRED project could explain the reason. Because of the non-representative sample size, the discussion of the results is focused on the total number of students, in order to obtain an overall view of the ecologies and their influence on the aforementioned academic aspects.

Activities

The data on extracurricular activities among students from the three schools participating in the SuperRED project provides valuable perspectives into the diverse interests and engagements of these students outside the classroom.

Table 2. Participation in Extracurricular activities

Extracurricular activity	**Participation**
Sports	76.73%
Participate in local or club sports teams	33.96%
Recreational activities	30.82%

Scouts	25.16%
Language clubs	15.09%
Playing musical instruments	13.21%
Artistic activities	11.95%
Games competitions	9.43%
Other	8.81%
Volunteering	2.52%
Robotic and science clubs	2.52%

A significant majority of students, 76,73%, participated in sports, with 33,96% involved in sports clubs. Other popular activities included recreational activities (30,82%) and scouts (25,16%). The high participation in sports reflects the importance of physical activities, which aligns with studies indicating that sports play a crucial role in students' social and physical development (Bailey, 2006; Dudley et al., 2022). The high participation in recreational activities and scouts underlines the importance of community and outdoor activities, supporting findings that these activities promote teamwork, leadership skills, and a sense of community (Habyarimana et al., 2022).

Other activities such as language clubs (15,09%), playing a musical instrument (13,21%), and artistic activities (11,95%) can be mentioned. The engagement in cultural and artistic activities is in line with research suggesting that such extracurricular activities contribute to students' academic and social skills (Cortellazzo et al. 2021). This influence of the most closely followed EA is reflected in the students' perception of the various aspects shown in Table 3.

Table 3: Students' perception of Extracurricular activities' impact

Impact in Extracurricular activities	Perception
EA provide stress relief, positively impacting academic focus	27.67%
EA develop communication, teamwork and leadership skills, benefiting academic skills and beyond.	27.04%
Balancing EA teaches me time management and discipline, improving academic organization	26.42%
EA enrich my learning experience	18.24%
EA keep me motivated and inspired in academics	14.47%
EA exposed me to diverse perspectives, enhancing critical thinking	11.95%
Community service broadens my perspective and encourages active citizenship, complementing academic learning	8.18%
Setting and achieving extracurricular goals teaches me how to do it academically	5.66%

Mentoring programs offer guidance and emotional support in the academic field	5.66%
EA allow practical application of classroom knowledge	5.03%

The majority of students believe that extracurricular activities provide stress relief, positively impacting academic focus (27,67%) and significantly enhance their communication, teamwork, and leadership skills (27,04%). They also recognize the value of these activities in teaching time management and discipline (26,42%). These perceptions align with research that supports the role of extracurricular activities in developing essential life skills and emotional well-being (Berger et al., 2020; Eccles & Barber, 1999).

However, they perceive a more modest impact directly on their academic performance: Setting and achieving extracurricular goals teaches me how to do it academically (5,66%) or EA allows practical application of classroom knowledge (5,03%). This observation is consistent with findings that while extracurricular activities are beneficial for personal and social development, their direct impact on academic outcomes can be disparate (Feraco et al., 2023). This perspective reflects research that points to the stress-relieving benefits of extracurricular activities and their role in personal development, even if their academic benefits are not always directly evident (Fredricks & Simpkins, 2012).

Resources

The data on trusted learning resources among students from the three schools in the SuperRED project reveal different preferences and levels of trust in various educational materials.

Table 4. Students' preferences of the resources

Resource	Preference
Books	81.13%
Class materials	66.04%
Videos	55.97%
Online articles	42.77%
Classmates notes	42.14%
Apps	40.25%
Practical experience	39.62%
Multimedia resources	32.08%
Online courses	27.67%
Library resources	23.27%
Other	8.18%

This preference for traditional resources is supported by research suggesting that students often trust structured and teacher-endorsed materials for reliable information (Mayer, 2020). This suggests a

strong preference for professionally created and validated materials, which aligns with findings that highlight the importance of perceived credibility and authority in learning resources (MGrew and Byrne, 2020).

The evaluation of online resources among students from the three schools in the SuperRED project reflects differing levels of scrutiny and methods for ensuring the reliability of information. Some students appear to rely more on information provided by their teachers, which they recognize as having academic rigor and integrity. Others are more open and seek additional resources in addition to the traditional ones provided by teachers. This difference may be related to differences in perceptions and abilities in searching, analysing, and selecting information in the school. Research indicates that students who rely on traditional sources, such as those provided by teachers, often do so because of the belief in the credibility and authority of these sources (Keshavarz & Esmaeili Givi, 2020). In contrast, students who explore other resources demonstrate a more general approach to information literacy, frequently engaging in cross-referencing and using different information channels, which can enhance critical thinking and evaluative skills (Hahnel et al. 2020). This difference underlines the importance of teaching comprehensive digital literacy skills to enable students to effectively navigate and understand the massive range of available information (Guitert et al., 2020).

However, the variety in the distribution of trust in online resources reflects a different approach to learning, incorporating both traditional and modern resources. Therefore, it is interesting to explore what procedures students use to ensure the reliability of the resources they find online, as well as what benefits they believe the use of technology brings to their learning. The two following tables contain the results obtained for both aspects.

Table 5: Students' evaluation of online resources

Evaluation of online resources	Confidence
Cross-reference information	41.51%
Resources from trusted institution	40.88%
Reviews and ratings	35.22%
Publication date	25.16%
Cautious with user-generated content	23.27%
Domain and website of the resource	22.01%
Consult teachers and librarians	16.98%
Search engines	15.72%
Educational platforms	10.06%
Number and quality of citations	10.06%
Other	1.89%

Students prioritize cross-referencing multiple sources (41,51%) and online resources from trusted institutions (40,88%) This approach underscores the importance of credibility and verification in their online research habits, that is in line with best practices in digital literacy, emphasizing the need for critical evaluation skills in the digital age (Leu et al., 2015).

However, there is a significant portion who may be vulnerable to misinformation. Research supports the importance of source verification and credibility checks in enhancing the quality and reliability of online information used by students (Wineburg & McGrew, 2019).

These findings suggest the need for specific educational strategies to enhance students' digital literacy skills, particularly in evaluating the credibility of online resources. Teachers and policymakers must focus on teaching students critical thinking and verification techniques to navigate the complex information landscape effectively.

The use of technology among students in the SuperRED project reveals different perceptions regarding its benefits and drawbacks in educational contexts.

Table 6. Students' opinion about technology

Technology	Perception
Flexibility	63.52%
Time management	59.12%
Distraction	54.72%
Self-regulated learning and setting goals	40.25%
Different styles of learning	38.36%
Individualized learning	28.30%
Continuous learning following	25.79%
Instant feedback exams	24.53%
Gamification increase motivation	17.61%
Peer learning and SRL	8.18%

With 77.6%, students view technology as providing learning flexibility, time management (59,12%) and supporting self-regulated learning (40,25%). However, 54,72% acknowledge that technology and social networks can be distracting. These findings are also reflected in educational research, where technology is recognized for its potential to enhance learning autonomy and organization (Jin et al. 2023), but also for its capacity to introduce distractions (Junco & Cotten, 2012).

This balance between being aware of the benefits and dealing with the distractions of technology is consistent with research that highlights the dual-edged nature of digital tools in educational settings (Kozyreva et al., 2020).

The differences in responses among students from different countries demonstrate the importance of integrating technology in a balanced way, maximizing its benefits while minimizing potential

distractions. Teachers and policymakers should focus on developing digital literacy and self-regulation skills to help students deal with the challenges of technology use in learning contexts.

Relationships

The preferences for academic interactions among students in the SuperRED project reveal different approaches to seeking academic support and engagement across the participants.

Table 7. Students' academic interactions

Academic interaction	Preference
Study groups	59.75%
Peer tutoring	48.43%
Tutor	24.53%
Summer camps	11.95%
Academic contests	9.43%
Online learning communities	8.81%
Other	6.92%
None	5.66%
Study skills workshops	5.03%

Students show a preference for study groups (59,75%), peer tutoring (48,43%) and meeting with their class tutor (24,53%). However, only a small percentage (5,03%) participate in study skills workshops. The preference for study groups is supported by studies that show that collaborative learning environments can improve understanding and comprehension of information (Johnson et al., 2014). The preference for direct, personalized interactions aligns with research that supports the efficacy of one-on-one tutoring and peer-assisted learning in enhancing academic performance (Carvalho and Santos, 2021). The low participation in study skills workshops suggests a potential area for improvement in promoting these resources as important tools for academic success. Research supports the importance of classroom interactions in fostering a productive learning environment and improving student motivation and learning results (Knickenberg & Zurbriggen, 2025).

Self-Regulated Learning

Once the students answered the questions from the questionnaire analyzed in the previous sections, they were asked how all these aspects helped them when it comes to setting your goals and planning your learning.

The questionnaire asks students to rate on five levels (Nothing, A little, Regular, Quite, and A lot) how each of the analyzed aspects (Extracurricular activities, Resources, and Relationships) influences the way they set their goals and plan their learning (Goals and planning), their motivational beliefs such as self-efficacy or expectation management (Motivational beliefs), and the learning of self-control

techniques or methods (Self-control). The table shows the results obtained for the two highest-rated categories (Quite and A lot).

The analysis of students' motivational beliefs and learning self-control techniques across the three schools reveals distinct patterns influenced by extracurricular activities, resources, and relationships.

Table 8. Students' reliability for self learning control

Sum of *Quite* and *A lot* results	**Activities**	**Resources**	**Relationships**
Goals and planning	37.74%	42.77%	33.33%
Motivational beliefs	49.69%	30.19%	32.70%
Self-control	38.99%	27.67%	26.42%

The findings of these questions highlight the critical role that extracurricular activities, resources, and relationships play in shaping students' motivational beliefs, goal setting, planning, and self-regulation across the different schools of the project.

Extracurricular activities have a significant influence on motivational beliefs (49.69%). This suggests that a robust extracurricular program can provide an environment conducive to developing essential self-motivation skills (Denault and Guay, 2017). The strong influence of resources (42.77%) on goal setting and planning also highlights the importance of a solid support system in fostering academic success (Feraco et al., 2023).

However, the relatively low impact of resources on self-control (27.67%) indicates a potential area for educational improvement, where teachers could focus on using resources to enhance students' self-regulation skills (Hennecke & Bürgler, 2023).

The influence of relationships on these factors is comparatively lower which could indicate a need for integrating self-regulation strategies into educational programs to better support student development (Duckworth et al., 2014).

Overall, these findings emphasize the necessity of a multifaceted approach to education that includes strong extracurricular programs, good resources, and supportive relationships. This approach can significantly enhance students' self-regulated learning, motivation, and overall academic success.

By focusing on these elements, teachers can better support students in developing the skills and competencies required for academic and personal growth, ultimately fostering more resilient and adaptable students, capable of success in different learning environments.

The students also answered the question: How do you monitor your progress and assess your learning? The approaches to progress monitoring and feedback among students reveal different preferences and practices, as table 9 shows.

Table 9. Students' way to monitor their progress

Progress monitoring and feedback	**Preference**
Contrast with learning objectives	39,62%

Peer feedback	39,62%
Tests and activities	35,85%
Self-reflection	33,96%
Teacher feedback	31,45%
Online tool to measure the progress	20,75%
Control points	18,87%
Rubrics or similar	11,95%
Learning portfolios	11,32%
Co-evaluation or self-evaluation controls	8,81%
None	2,52%
Other	1,89%

Students frequently evaluate their progress against learning objectives, with 39,62% engaging in this practice. They also seek peer feedback (39,62%) and use quizzes and tests (35,85%) to evaluate their understanding and improve their work. and use personal reflection (33,96%) as a key tool for self-assessment. The active use of peer feedback aligns with research indicating its effectiveness in enhancing learning and fostering a collaborative learning environment (Topping, 2024). The significant use of quizzes and tests aligns with research that supports the role of formative assessments in providing immediate feedback and guiding future learning (Sortwell et al., 2024).

However, the use of Control points or rubrics is less common, with only 18,87% and 11,95% of students respectively using them. This practice suggests that the participants are proactive in seeking feedback, there may be less dependence on structured assessment tools. Peer assessments and self-evaluations are less common, with only 8,81% of students participating in these practices. The preference for personal reflection reflects the importance of self-awareness and self-regulation in the educational context (Zimmerman, 2002). In contrast, the limited emphasis on co-evaluation and self-evaluation highlights a potential area for teachers to develop in order to promote more collaborative and reflective assessment practices among students.

These findings underline the importance of varied feedback mechanisms in supporting student learning and progress monitoring. By understanding these preferences, teachers can change their assessment strategies to better meet the needs of their students.

Finally, in response to the question: Do you make adjustments based on external feedback or self-reflection? Students express the ways in which they adjust their learning strategies, as table 10 shows.

Table 10: Students' way to monitor their progress

Learning adjustment	Percentage
Feedback	58,49%

Self-reflection	38,99%
Balance feedback and self-reflection	30,82%
Other	1,26%
None	1,26%

Students often adjust their learning strategies based on feedback received, with 58,49% making changes according to the feedback provided by teachers or peers. Additionally, 38,99% of these students use self-reflection as a tool for adjustment. Notably, 30,82% of students balance both feedback and self-reflection in their adjustment processes. Research supports that constructive feedback can effectively improve student efforts and enhance learning results (Younis et al., 2021). The emphasis on self-reflection reflects the importance of metacognitive strategies in fostering self-regulated learning, where students evaluate their progress and make changes (Zimmerman, 2002). The use of feedback comments complements this process by providing external perspectives that can guide improvement (Brookhart, 2017).

This dual approach is in line with educational research that suggests that combining external feedback with self-assessment fosters self-regulated learning and promotes deeper understanding (Hattie & Timperley, 2007; Yan et al., 2021).

These findings demonstrate the diverse approaches to feedback adjustment among students from different cultural contexts, highlighting the importance of both external feedback and self-reflection in promoting effective learning strategies.

CONCLUSION, IMPLICATIONS AND SUGGESTIONS

The findings of this study provide a comprehensive view of how cultural contexts shape educational practices and student experiences across the schools of three different European countries.

The results show that extracurricular activities, mostly sports, recreational activities and scouts, have a significant influence on students' stress relief, positively impacting academic focus and significantly enhance their communication, teamwork, and leadership, but perceiving a more modest impact directly on their academic performance This finding supports the systematic inclusion of extracurricular activities as a key element in education to foster student engagement and motivation.

Traditional educational resources remain highly valued. Books and class materials are the most trusted and frequently used resources by students. This preference highlights the importance of maintaining structured, teacher-endorsed materials while critically integrating digital resources, incorporating both traditional and modern resources.

About online resources, students prioritize cross-referencing multiple sources and resources from trusted institutions, while there is a significant portion who may be vulnerable to misinformation, suggesting the need for specific educational strategies to enhance students' digital literacy skills, particularly in evaluating the credibility of online resources.

Students perceive that technology supports flexibility and time management, but also acknowledge its potential for distraction. This dual effect reinforces the importance of teaching digital self-regulation skills to maximize the educational benefits of technology.

A significant proportion of students regularly assess their progress in relation to learning objectives, and seek feedback from peers, using quizzes and tests to monitor their understanding and refine their work. Although they point to personal reflection as a key strategy for self-assessment, the relatively limited use of co-evaluation and self-evaluation points to an area where teachers could enhance their practices, encouraging more collaborative and reflective approaches to assessment.

The analysis of students' motivational beliefs and self-regulation strategies across the three schools highlights the differentiated influence of extracurricular activities, available resources, and interpersonal relationships. Among the three dimensions (goals and planning, motivational beliefs, and self-control) motivational beliefs show the strongest association with extracurricular activities (49.69%), suggesting that active engagement outside the classroom can significantly reinforce students' confidence, interest, and persistence in learning. In contrast, goals and planning are more strongly linked to the availability of educational resources (42.77%), pointing to the importance of structured materials and tools in helping students set and organize their academic objectives.

On the other hand, relationships—though still relevant—appear to have a comparatively lower impact across all three areas, especially in self-control (26.42%). This indicates that while positive interactions with peers, teachers, and family members do support learning, their influence may not be as direct or pronounced in fostering students' ability to regulate their own behaviour and emotions during learning tasks. These findings underscore the need for schools to balance their efforts, enhancing not only individual motivation and access to resources, but also strengthening supportive relationships and promoting co-regulation strategies that nurture more autonomous and resilient learners.

The main limitation of the study has been the limited representativeness of the sample, so its results should be taken as an indication of how learning ecologies serve as a holistic research framework for studying the relationships across the formal–non-formal education continuum. Consequently, this article opens new lines of research, such as conducting comparative studies across different educational systems on local or cultural aspects in relation to learning ecologies, as well as exploring in greater depth the most relevant aspects identified in this study, such as the benefits and challenges of implementing technological innovations in schools depending on the local context, and how these elements interact with students' learning ecologies and influence their capacity for Self-Regulated Learning (SRL).

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Ownership of Learning in Distance Education: Building Accessible and Resilient Pathways to Lifelong Learning

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Exchanging ideas for inclusive, scalable, and sustainable education: Accessibility and Resilience

As technology evolves, resilient and accessible pathways will empower learners to move from passive recipients to architects of their education, designing futures that outlast uncertainty!

ABSTRACT

In the rapidly evolving digital era, distance education has become a cornerstone for lifelong learning, yet fostering genuine ownership of learning, where learners actively assume responsibility for their educational journey, remains both a challenge and an imperative. This paper explores how accessible and resilient learning pathways can be developed to strengthen learner autonomy, engagement, and sustainability within Open Flexible Distance Learning (OFDL). Employing a qualitative approach through a Systematic Literature Review (SLR), the study synthesizes global scholarly works and policy frameworks published between 2015 and 2025. Anchored in Self-Determination Theory, Connectivism, and the Community of Inquiry framework, the analysis provides a multidimensional understanding of the interplay between learner agency, digital accessibility, and resilience. Findings identify three interlinked determinants for enhancing ownership of learning: (i) Learner-Centered Design, emphasizing personalized pathways and adaptive technologies; (ii) Accessible Infrastructure, ensuring equitable access to digital platforms and resources regardless of socio-economic or geographical contexts; and (iii) Resilient Support Ecosystems, comprising mentoring, peer networks, and digital communities that sustain motivation and adaptability. The inquiry highlights that while technological innovation broadens educational opportunities, the absence of intentional pedagogical strategies risks undermining learner ownership, leading to disengagement and dropout. The study's uniqueness lies in conceptualizing learning ownership as a driver and an outcome of resilient, inclusive lifelong learning systems in OFDL. Practical implications urge institutions to invest in learner analytics, inclusive design, and educator professional development for digital facilitation. Future research should investigate cross-cultural perspectives and the longitudinal impacts of learner ownership on personal and career development trajectories.

Keywords

Ownership of learning; OFDL; lifelong learning; learner-centered design; digital accessibility; resilient learning ecosystems; self-determination theory; SLR

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INTRODUCTION

Rationale

The rapid advancement of digital technologies, coupled with the growing acceptance of Open Flexible Distance Learning (OFDL), has fundamentally redefined the landscape of lifelong learning (Sembiring, 2024a). The traditional notion of learning as a one-time, institution-centered process has shifted toward a learner-centered paradigm. Here, individuals are expected to take greater ownership of their learning journeys. This ownership is not merely about autonomy (Lee et al., 2024). It encompasses learners' capacity to set goals, manage their learning processes, access relevant resources, and adapt to emerging challenges (Conley & French, 2014; Magin, 2025; X.-Y. Wu, 2024). In the context of distance education, the digital era offers unprecedented opportunities for accessibility (breaking down geographical, economic, and time-related barriers) and resilience (equipping learners to sustain and adapt their learning practices despite disruptions, e.g., pandemics, economic downturns, or technological changes. As societies move toward knowledge-driven economies, developing accessible and resilient learning pathways become essential both for individual success and for national competitiveness and social equity (Hariram et al., 2023).

Urgency

While digital transformation has opened new opportunities, it has also widened disparities in digital literacy, self-regulation skills, and access to enabling technologies (Singun, 2025). The COVID-19 pandemic revealed that learners without strong self-directed learning skills or adequate digital infrastructure struggled to maintain continuity in their education. In distance education, where the teacher's physical presence is minimal, learners must rely more heavily on intrinsic motivation, time management, and problem-solving abilities. Without a deliberate framework to foster ownership of learning, many students' risk disengagement, low completion rates, and reduced employability in the future workforce. At the same time, in the era of constant disruption, resilience is no longer optional. Learners must be prepared to continuously acquire, unlearn, and relearn skills across their lifetime, navigating rapid changes in job markets and societal needs. Building ownership of learning is thus urgent for cultivating adaptable, future-ready citizens (Li, 2024).

Gaps

Although research on self-directed learning, digital literacy, and distance education is abundant, significant gaps remain in terms of: (i) Fragmentation of approaches: Existing studies often treat learner autonomy, accessibility, and resilience as separate constructs rather than as interconnected dimensions of ownership in learning. (ii) Contextual limitations: Much research originates from developed countries, with limited focus on contexts such as Indonesia or similar Global South settings, where cultural, infrastructural, and socio-economic factors strongly influence learning ownership. (iii) Integration with OFDL frameworks: There is a lack of comprehensive models integrating ownership of learning within the pedagogical, technological, and social frameworks of open, flexible, and distance education. (iv) Measurement and assessment: Few practical tools exist to evaluate learners' level of ownership in OFDL environments, making it challenging for institutions to design targeted interventions.

Research Questions and Objectives

This study aims to address the following research questions:

(i) How can ownership of learning be effectively fostered in distance education to create accessible and resilient pathways for lifelong learning in the digital era?
(ii) What key factors (technological, pedagogical, and socio-cultural) affect learners' capacity to take ownership of their learning in OFDL environments?
(iii) How can distance education institutions design interventions that balance accessibility with the development of learner resilience and autonomy?

The main objective, therefore, is to develop a conceptual framework for fostering ownership of learning in distance education, aimed at building accessible and resilient lifelong learning pathways in the digital era (Sato et al., 2023).

Moreover, additional objectives are to:

(i) Analyze the interplay between accessibility, resilience, and ownership of learning in OFDL contexts.
(ii) Identify best practices and innovative strategies that support learner autonomy in diverse socio-economic and cultural settings.
(iii) Propose practical recommendations for distance education institutions to integrate ownership-building practices into their curricula, learning support systems, and digital platforms.
(iv) Highlight policy implications for enhancing equitable access and sustained learner engagement in distance education.

Expected Results

The inquiry is expected to generate *conceptual contributions* and *practical outputs* that will benefit distance education stakeholders (learners, educators, institutions, and policymakers).

Conceptual Contributions include:

(i) Integrated Framework for Ownership of Learning in OFDL, i.e., a comprehensive model illustrating how accessibility, resilience, and learner autonomy intersect in distance

education, informed by theories such as Self-Determination Theory, Connectivism, and the Community of Inquiry Framework.

(ii) Operational Definition and Dimensions of Ownership, i.e., a clear articulation of ownership in the context of distance learning, breaking it down into measurable dimensions such as goal-setting capacity, self-regulation, digital literacy, adaptability, and reflective practice.

(iii) Contextual Insights from the Digital Era, i.e., evidence-based understanding of how socio-cultural, technological, and economic factors influence the degree of learning ownership in various settings, especially in developing countries and Global South contexts.

Practical Outcomes include:

(i) Best Practices and Strategies, i.e., a curated set of actionable strategies and examples for fostering ownership of learning through curriculum design, digital platforms, learner support services, and assessment methods.

(ii) Institutional Roadmap for Accessibility and Resilience, i.e., guidelines for distance education institutions to balance technological access with skill development for lifelong learning resilience.

(iii) Learner Assessment Tools, i.e., a proposed tool or rubric for evaluating learners' level of ownership in a distance learning environment, enabling targeted interventions and monitoring progress over time.

Broader Impacts include:

(i) Enhanced Learner Retention and Success, i.e., anticipated improvement in learner engagement, persistence, and completion rates in OFDL programs.

(ii) Policy Implications, i.e., recommendations for educational policies that promote equitable access, resilience, and learner empowerment in the era of rapid technological and social change.

(iii) Contribution to Sustainable Development Goals (SDGs), i.e., direct alignment with SDG 4 (Quality Education), supporting inclusive, equitable, and lifelong learning opportunities for all (Demir, 2024).

RELATED THEORETICAL FOUNDATION

The concept of ownership of learning in distance education is best understood through the integration of complementary theoretical perspectives that illuminate the psychological, technological, and social dimensions of the learning process. This study draws primarily on Self-Determination Theory (Deci & Ryan, 1985, 2000; Ryan & Deci, 2000), Connectivism (Dunaway, 2011; Siemens, 2005), and the Community of Inquiry Framework (Garrison et al., 2001; Garrison & Arbaugh, 2007a; Garrison & Archer, 2000). Each of them offers distinct yet interconnected insights for building accessible and resilient lifelong learning pathways in the digital era.

Self-Determination Theory

This theory underpins the Psychological Foundation of Learning Ownership. This theory provides a robust framework for understanding the intrinsic and extrinsic motivations that underpin learner autonomy. Self-Determination Theory posits that human motivation is optimized when three basic psychological needs are met: autonomy (the ability to self-direct and make meaningful choices),

competence (feeling capable of mastering tasks), and relatedness (feeling connected to others in the learning community).

In the context of distance education, ownership of learning aligns closely with the following needs: (i) Autonomy – manifests in learners' ability to set goals, manage their schedules, and select learning resources. (ii) Competence – grows through iterative feedback, skill mastery, and access to clear learning pathways. (iii) Relatedness – cultivates through online communities, peer collaboration, and supportive teacher presence (Bhardwaj et al., 2025).

By leveraging Self-Determination Theory, distance education can be designed to intentionally nurture these needs, thereby increasing learner engagement, persistence, and resilience, especially critical in self-paced, minimally supervised environments.

Connectivism

This theory is tightly related to the technological and networked learning dimension. Connectivism reframes learning for the digital age (Corbett & Spinello, 2020). It emphasizes that knowledge resides not only within individuals but also across networks of people, digital platforms, and information sources. In this view, learning ownership is characterized by a learner's ability to: (i) Identify and connect with relevant information nodes, human and non-human. (ii) Continuously update knowledge through active engagement with digital networks. (iii) Apply networked intelligence to solve problems and adapt to change.

In distance education, Connectivism reinforces that accessibility is more than having internet connectivity. It also involves the capacity to navigate, evaluate, and contribute to global knowledge ecosystems. Learners who can actively manage their networks are more likely to build resilient learning pathways, remaining adaptable in the face of evolving digital landscapes and information overload.

Community Of Inquiry Framework

It is tightly related to the social and cognitive presence in learning ownership. The Community of Inquiry framework (Fiock, 2020; Richardson et al., 2017) identifies three interdependent elements that define meaningful online learning: (i) cognitive presence (the extent to which learners can construct and confirm meaning), (ii) social presence (the ability to project oneself socially and emotionally in an online community), and (iii) teaching presence (the design, facilitation, and direction of cognitive and social processes).

Ownership of learning in OFDL contexts requires a dynamic interplay between these three presences in the sense that: (i) Cognitive presence fosters critical thinking and reflective learning, essential for self-directed progress. (ii) Social presence sustains motivation and a sense of belonging, mitigating the isolation often reported in distance education. (iii) Teaching presence supports learner autonomy without over-directing, striking a balance between guidance and independence. The Community of Inquiry framework underscores that even in self-directed learning, structured and supportive interaction is vital for deep engagement and resilience (Sembiring, 2024b).

Integrative Perspective

By synthesizing Self-Determination Theory, Connectivism, and Community of Inquiry, a multidimensional understanding of learning ownership emerges in the following ways: (i) Self-Determination Theory addresses the why of learning ownership (motivation and psychological

readiness). (ii) Connectivism addresses the where and how (networked resources, digital navigation, and adaptability). (iii) The Community of Inquiry framework addresses the with whom and in what structure (collaborative engagement and guided facilitation).

Together, these perspectives provide conceptual scaffolding for designing OFDL environments that are not only accessible in terms of technology and resources but also resilient in fostering sustained learner engagement over time. This integrated theoretical foundation enables the development of a holistic model for ownership of learning. That is the one that bridges psychological empowerment, networked literacy, and community-based interaction. Such a model is essential for advancing the inquiry's goal of building accessible and resilient lifelong learning pathways in the digital era (Bozkurt et al., 2024).

RESEARCH DESIGN

Systematic Literature Review

This study adopts a qualitative approach in the form of a Systematic Literature Review, or SLR (Atkinson & Cipriani, 2018; Dickinson, 1995; Gupta et al., 2024). That is to synthesize and critically analyze existing scholarly work on ownership of learning within the context of distance education, particularly in building accessible and resilient lifelong learning pathways in the digital era. The choice of SLR is aligned with the study's aim to integrate fragmented insights, address identified knowledge gaps, and develop a conceptual framework that is theoretically grounded and contextually relevant.

Given that the identified research gaps include the fragmentation of approaches, limited contextualization to the Global South, and a lack of integrated frameworks, an SLR enables the systematic identification, selection, evaluation, and synthesis of relevant literature. This approach ensures transparency, replicability, and comprehensiveness in mapping the current state of knowledge, while avoiding anecdotal or biased interpretations. It facilitates the integration of findings across multiple disciplines (education, psychology, instructional design, and educational technology) that are relevant to ownership of learning in OFDL.

Systematic Review Syntax

The review follows a six-step syntax adapted from established SLR guidelines (Kitchenham & Brereton, 2013; Snyder, 2019) to ensure methodological rigor.

Syntax 1. Formulation of Research Questions – Guided by the study's main and additional objectives, the research questions are: (i) How can ownership of learning be effectively fostered in distance education to create accessible and resilient pathways for lifelong learning in the digital era? (ii) What key factors (technological, pedagogical, and socio-cultural) affect learners' capacity to take ownership of their learning in OFDL environments? (iii) How can distance education institutions design interventions that balance accessibility with the development of learner resilience and autonomy?

Syntax 2. Identification of Keywords and Search Strategy – The Keywords will be developed based on the research questions, including: (i) "ownership of learning" OR "learner autonomy" OR "self-directed learning" AND "distance education" OR "open flexible distance learning" OR "OFDL" AND "accessibility" OR "resilience" OR "lifelong learning." (ii) Searches will be conducted in major academic databases (Scopus, Web of Science, ERIC, ScienceDirect, SpringerLink, and Google Scholar) will be included where they are relevant.

Syntax 3. Inclusion and Exclusion Criteria: (i) Inclusion (Peer-reviewed journal articles, book chapters, conference papers, and relevant reports published between 2010–2025. Studies focusing on distance education, ownership of learning, accessibility, resilience, and lifelong learning. Works in English and Indonesian to ensure regional relevance. (ii) Exclusion (Studies unrelated to education or lacking empirical/theoretical depth. On-accessible full texts or works with insufficient methodological detail).

Syntax 4. Screening and Selection of Studies: (i) An initial screening will be conducted based on titles and abstracts, followed by a full-text review. (ii) A flow diagram will be used to document the selection process, ensuring transparency.

Syntax 5. Data Extraction and Coding: (i) A structured extraction template to collect: (a) Bibliographic details (author, year, and publication source. (b) Study context (country, education level, learning environment). (c) Theoretical frameworks used (Self-Determination Theory, Connectivism, Community of Inquiry). (d) Key findings (related to ownership, accessibility, resilience, and lifelong learning). (ii) Thematic coding to identify recurring patterns, relationships, and gaps.

Syntax 6. Synthesis and Framework Development: (i) Findings will be synthesized thematically, integrating psychological (Self-Determination Theory), technological (Connectivism), and social (Community of Inquiry) dimensions. (ii) The synthesis will result in a conceptual framework that addresses the research objectives and highlights implications for policy, practice, and future research.

Expected Outcome of the Method.

The systematic approach will yield a comprehensive, evidence-based conceptual model for ownership of learning in distance education that explicitly connects accessibility and resilience to lifelong learning. It will also generate best practice guidelines and policy recommendations for institutions and stakeholders, in line with the study's expected results and the achievement of SDG 4.

FINDINGS AND DISCUSSION

The systematic review identified recurring and interconnected themes that explain how *ownership of learning* can be cultivated in OFDL environments to ensure accessibility and resilience in lifelong learning. These findings reflect both the psychological readiness of learners, the technological and networked learning dimensions, and the social-structural support necessary for sustained engagement.

FINDING 1: Autonomy as the Core Driver of Learning Ownership

Elaborative Argument: Across multiple studies, *autonomy* emerged as the central dimension of *learning ownership* in OFDL environments (Namaziandost et al., 2024). Learners who could set personal goals, make decisions about learning resources, and pace their study schedules demonstrated higher engagement and better persistence rates. This aligns directly with Self-Determination Theory, which asserts that autonomy is a fundamental psychological need that enhances intrinsic motivation.

However, autonomy in distance learning is not simply the absence of teacher control; rather, it is the presence of structured choice, where learners are given freedom within guided frameworks. Research shows that fully unstructured learning can overwhelm students, especially those from educationally disadvantaged backgrounds. Thus, fostering autonomy in OFDL requires a deliberate scaffolding

strategy, such as offering flexible assignment formats, optional learning pathways, and self-paced modules while ensuring clear learning outcomes (Han & Reinhardt, 2022).

FINDING 2: Competence and Self-Regulation as Resilience Enablers

Elaborative Argument. The second theme emphasizes that *competence* (the perception of being able to master learning tasks) is inseparable from *self-regulation* in promoting resilience (Imhof et al., 2024). Distance learners with strong self-regulation skills (time management, goal monitoring, adaptive help-seeking) were better able to overcome disruptions such as unstable internet connections, shifting personal schedules, or changing work conditions.

From the Self-Determination Theory perspective, competence is nurtured through timely feedback, progressive challenges, and recognition of achievements. From the *Connectivist* lens, competence also includes digital navigation skills. That is the ability to evaluate information credibility, integrate knowledge from diverse sources, and troubleshoot technological issues. Findings indicate that without targeted support for self-regulation, even highly motivated learners can fail to persist. Effective strategies include embedding micro-assessments, providing self-monitoring tools in LMS platforms, and incorporating peer accountability mechanisms (Qi et al., 2023).

FINDING 3: Digital Literacy as the Gateway to Accessibility

Elaborative Argument: Accessibility in OFDL is often narrowly interpreted as mere access to devices and internet connectivity. The literature reveals that *digital literacy* (the ability to effectively use digital tools, platforms, and content) plays an equally critical role in enabling meaningful participation (D. Wu, 2024). Drawing from *Connectivism*, digital literacy is not a static skill set but a continuously evolving competence, requiring learners to adapt to new technologies, platforms, and modes of interaction. Learners lacking digital literacy may technically be "online" but are unable to exercise true ownership over their learning because they cannot confidently locate, evaluate, or apply information.

Institutional practices that integrate *digital literacy training* into onboarding programs and that offer ongoing technical support have been shown to improve not only accessibility but also learner confidence, participation, and retention (https://vida.id/en/blog/digital-literacy-definition-pillars-benefits).

FINDING 4: Social Presence as a Buffer Against Isolation

Elaborative Argument: A recurring challenge in OFDL environments is learner isolation, which can undermine motivation and persistence. The Community of Inquiry framework identifies *social presence* (the ability of learners to project themselves as "real people" in the learning environment) as a critical factor in sustaining engagement.

Findings indicate that ownership of learning is strengthened when learners feel part of an active, supportive community (Mairitsch et al., 2023). Peer discussions, collaborative projects, and mentor interactions contribute to a sense of belonging, which in turn reinforces persistence. This suggests that *ownership is not purely individualistic*. It thrives in environments where learners can share goals, exchange feedback, and celebrate progress together. This also ties back to *Self-Determination Theory's related dimension,* which highlights that human connection fuels sustained effort.

FINDING 5: Balanced Teaching Presence for Guided Autonomy

Elaborative Argument: Contrary to the misconception that self-directed learning in OFDL requires minimal teacher involvement, the literature consistently shows that *teaching presence* (the design, facilitation, and guidance provided by educators) is essential for ownership to flourish. The challenge is finding the right balance between *guidance and learner control* (van den Beemt et al., 2023).

From the Community of Inquiry perspective, teaching presence shapes both cognitive and social engagement. Instructors who provide clear expectations, constructive feedback, and proactive communication help learners maintain direction without eroding their autonomy. In Connectivist terms, teaching presence also involves curating relevant resources, modeling effective networked learning behaviors, and connecting learners with external knowledge nodes. This balanced approach fosters *guided autonomy*, where learners maintain control but benefit from expert scaffolding (Sharma & Giannakos, 2025).

FINDING 6: Institutional Support Systems as Structural Enablers

Elaborative Argument: Finally, findings highlight that ownership of learning cannot be solely attributed to individual learner traits (Lan, 2018). It is also a product of *institutional design and support systems*. Accessible LMS platforms, integrated learner analytics, mental health support, and adaptive learning technologies collectively contribute to sustained ownership.

Institutional policies that intentionally link *accessibility with resilience-building*, e.g., offering offline content for low-bandwidth areas or providing asynchronous collaboration options for working learners, will ensure that ownership is not restricted to those with optimal circumstances.

This reflects an integrative application of Self-Determination Theory, Connectivism, and Community of Inquiry, namely, psychological empowerment (Self-Determination Theory), networked resource access (Connectivism), and community-based engagement (Community of Inquiry) are all strengthened when institutions actively remove systemic barriers and create enabling conditions.

The Synthesis

Taken together, the findings reveal that ownership of learning in distance education is multi-dimensional and requires a holistic strategy (Pavlidou et al., 2021). Autonomy, competence, digital literacy, social connection, guided teaching presence, and institutional support form an interconnected ecosystem. The integrated theoretical lens: Self-Determination Theory provides the motivational core. Connectivism offers the networked knowledge dimension. Community of Inquiry emphasizes the socio-cognitive structure, enabling a comprehensive understanding of how ownership can be cultivated to create accessible and resilient lifelong learning pathways.

The Urgency of Ownership of Learning in the OFDL Perspective Related to Synthesis of the Findings

In the context of OFDL, the urgency of cultivating ownership of learning has never been more critical. The digital era has transformed education into a highly flexible, learner-driven ecosystem where access to knowledge is abundant, yet meaningful engagement and sustained motivation are not guaranteed (Zou et al., 2025). Unlike traditional face-to-face systems, OFDL places learners in environments that demand a higher degree of self-direction, persistence, and accountability. Without genuine ownership

of their learning process, students in OFDL are at significant risk of disengagement, alienation, and eventual dropout. How then to avoid and mitigate those potential unintended risks?

Shift from Teacher-Driven to Learner-Driven Paradigms

Traditional education models emphasize instructor control, structured schedules, and classroom-based accountability. In contrast, ODL repositions learners at the center of their educational journeys, requiring them to manage their pace, navigate digital platforms, and make active decisions about their pathways. This shift makes ownership of learning not merely an added value, but a survival skill. Learners who lack agency are less likely to thrive in open, flexible systems where institutional monitoring is limited (Rupnik & Avsec, 2025).

Demand for Lifelong Learning in the Disruption Era

In today's disruption era, marked by rapid technological changes, global uncertainties, and shifting labor market demands, learning can no longer be confined to fixed stages of life (Shen & Zhang, 2024). Ownership of learning empowers individuals to embrace lifelong learning as a continuous, self-initiated process. For OFDL learners, this urgency is amplified, since many are adult professionals, working parents, or geographically distant individuals who must independently align their learning with personal goals and career trajectories. Ownership of learning transforms education from being reactive (meeting external requirements) into proactive (navigating lifelong growth).

Ensuring Resilience in Uncertain Contexts

Distance learners often face challenges such as digital inequities, unstable connectivity, competing responsibilities, and limited access to academic communities. In these circumstances, resilience (the ability to adapt, persist, and overcome barriers) becomes indispensable. Ownership of learning serves as the psychological and strategic foundation for resilience. Learners who take responsibility for their progress are more capable of seeking support, leveraging digital communities, and innovatively using limited resources to sustain their learning (Zamiri & Esmaeili, 2024).

Bridging Digital Accessibility and Pedagogical Gaps

While technology has democratized access to information, accessibility alone does not ensure meaningful learning (Bulathwela et al., 2024; Seo et al., 2024). Without ownership, learners may consume content passively, failing to internalize or apply knowledge. Furthermore, digital tools, if not paired with intentional pedagogy, risk creating superficial engagement. Ownership of learning is the missing link between accessibility and transformation. It ensures that learners actively transform accessible content into personal knowledge, competencies, and applied skills.

The Institutional Imperative for Sustainability

From the perspective of OFDL institutions, fostering ownership of learning is crucial for sustainability, retention, and quality assurance. High dropout rates have long plagued distance education. Research shows that dropout is often not due to a lack of resources but a lack of sustained motivation and connection (Seo et al., 2024). By embedding strategies that promote learner agencies such as adaptive pathways, mentoring, and participatory communities, institutions will not only enhance learner outcomes but also secure their credibility and competitiveness in a crowded global education market.

Alignment with Global Agendas and Equity Goals

On a broader level, fostering ownership of learning aligns with the United Nations' Sustainable Development Goal 4, i.e., Quality Education (UNESCO, 2024). This emphasizes inclusive, equitable, and lifelong learning opportunities for all. Ownership ensures that learners from diverse socio-economic, cultural, and geographic backgrounds are not passive recipients but active shapers of their education. This is particularly urgent for OFDL, which often serves marginalized and underrepresented learners who rely on education as a transformative tool for social mobility (Mian, 2023).

Theoretical Urgency: Integration of Motivation, Networks, and Social Presence

The integrated theoretical lens underscores the urgency further. Self-Determination Theory highlights that without autonomy, competence, and relatedness, motivation deteriorates. Connectivism reminds us of that learning in digital environments requires learners to continuously form and navigate networks of knowledge. Community of Inquiry stresses that cognitive presence cannot be built in isolation. It thrives on social presence and teaching presence. Ownership of learning operationalizes these theories in practice, that is, it provides the motivational spark, the networked agency, and the social engagement that make OFDL effective (Chan et al., 2014; Hancock et al., 2023; Rainer & Matthews, 2002).

Analytical Reflection

The urgency of ownership of learning in OFDL therefore arises from its pivotal role as the foundation for autonomy, resilience, and lifelong learning in digital ecosystems. Without it, the promise of open and flexible education risks collapsing into superficial participation and high attrition. With it, learners are empowered to navigate uncertainty, institutions secure sustainability, and societies cultivate citizens capable of continuous growth in a rapidly evolving world (Scheel et al., 2022).

CONCLUDING REMARKS AND RECOMMENDATIONS

Remarks

This inquiry has synthesized insights from a diverse body of literature to develop a multi-dimensional understanding of ownership of learning in OFDL environments. By integrating Self-Determination Theory, Connectivism, and the Community of Inquiry Framework, the study offers a novel conceptual framework that positions ownership of learning as the dynamic intersection of autonomy, competence, digital literacy, social connection, and institutional support (Alam & Mohanty, 2023).

The uniqueness of this work lies in: (i) Integrative Theoretical Approach – While previous studies examined learner autonomy, accessibility, and resilience as separate constructs, this study unites them within a coherent framework informed by Self-Determination Theory, Connectivism, and the Community of Inquiry Framework (ii) Contextual Relevance to the Digital Era – The model addresses both psychological and technological readiness, acknowledging the evolving demands of lifelong learning in rapidly changing digital environments. (iii) Application to Diverse Contexts – By considering socio-cultural and infrastructural realities, especially in the Global South, the framework offers adaptable strategies beyond the high-resource settings that dominate current literature.

The findings confirm that ownership of learning is not merely an individual trait but an emergent property of well-designed learning ecosystems that integrate learner agency, networked resources, community engagement, and structural support. In doing so, the study directly supports the

advancement of SDG 4 (Quality Education) by promoting inclusive, equitable, and resilient lifelong learning opportunities.

Recommendations

Here are the specific and relevant recommendations. The first is for Distance Education Institutions. They need to: (i) Embed Ownership-Building Strategies into Curriculum Design, i.e., incorporate flexible pathways, choice-based assessments, and learner-driven projects that encourage autonomy while maintaining guided structures. (ii) Enhance Digital Literacy Training, i.e., offer continuous, embedded support for digital navigation, information evaluation, and networked learning skills. (iii) Strengthen Support Systems, i.e., provide accessible technical assistance, mental health resources, and adaptive learning technologies to reduce systemic barriers.

The second is for Educators and Facilitators. Further needs to: (i) Adopt a Guided Autonomy Approach, i.e., balance freedom and structure by offering clear expectations, timely feedback, and curated learning resources while respecting learner agency. (ii) Cultivate Social Presence, i.e., facilitate peer interaction and collaborative learning activities to reduce isolation and strengthen relatedness.

The third is for Policymakers and Education Stakeholders: (i) Invest in Digital Infrastructure, i.e., ensure equitable access to high-speed internet, affordable devices, and community learning hubs. (ii) Promote Inclusive Policy Frameworks, i.e., support policies that integrate resilience-building into educational planning, emphasizing lifelong learning beyond formal schooling.

Futuristic Anticipation

Four essential aspects of composing direction for future exploration: (i) Empirical Validation of the Framework, so that future studies should test the proposed conceptual model in diverse OFDL contexts to evaluate its robustness and adaptability. (ii) Development of Measurement Tools, that is, to create and validate instruments to assess the degree of learning ownership, enabling institutions to track and enhance learner progress. (iii) Longitudinal Studies, i.e., investigate how ownership of learning evolves, predominantly in response to technological and socio-economic changes. (iv) Cross-Cultural Comparisons, i.e., explore how cultural values influence autonomy, digital literacy, and resilience in different regions, informing context-sensitive interventions.

Call to Action

In an era where knowledge rapidly evolves and disruption is the norm, fostering ownership of learning in distance education is both a pedagogical necessity and a strategic imperative. Institutions that intentionally integrate autonomy, competence, digital literacy, social presence, and systemic support into their OFDL environments will not only enhance accessibility and resilience but will also prepare learners to thrive as self-determined, adaptable, and networked lifelong learners in the digital era (Sembiring, 2021).

True ownership of learning in distance education is the ability to transform disruption into direction, where each barrier becomes a bridge toward lifelong growth!

AUTHOR NOTES

Data Accessibility Statement

The research methods and hypotheses for this study were arranged for this research purpose by meticulously reviewing relevant references. Further clarification will be provided whenever needed.

Sustainable Development Goals (SDGs)

This study is linked to SDG 4 (Quality education).

Ethics and Consent

This study followed ethics clearance from the Institute for Research and Community Services of Universitas Terbuka, Indonesia.

Author Contributions (CRediT)

Maximus Gorky Sembiring: Conceptualization, Funding related acquisition, Information collection, Analysis and synthesis, Research administration, Writing – starting with initial draft, Writing – reviewing, synthesizing, and editing. I read and agreed to the final version of the manuscript.

Walls or schedules will not define the classrooms of tomorrow, but by learners who claim responsibility for shaping knowledge ecosystems that adapt as fast as the world changes!

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In the future of distance education, ownership of learning will no longer mean consuming content, but curating one's lifelong journey with resilience as the compass and accessibility as the map!

30th International Council for Open and Distance Education World Conference 2025

Transforming Distance Education: Impact of GenAI on Learning Patterns and Student-Academic Interactions

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Exchanging ideas for inclusive, scalable, and sustainable education: Innovation and Openness

Lifelong learning in the age of GenAI means that education will follow the learner, i.e., adaptive, responsive, and limitless, turning every moment into an opportunity for growth!

ABSTRACT

The rapid integration of Generative Artificial Intelligence (GenAI) into higher education is reshaping learning configurations and redefining student–academic interactions, particularly in distance education environments. This study investigates the transformative role of GenAI in fostering personalized, adaptive, and interactive learning experiences, with a specific focus on student engagement, critical thinking, and academic support within virtual environments. Employing a Mixed-Methods Exploratory Design, the inquiry begins with a Systematic Literature Review to synthesize existing research and then generate hypotheses. These are subsequently tested through quantitative analysis using Smart PLS-SEM. The study is theoretically grounded in Constructivist Learning Theory, Connectivism, and the Community of Inquiry Framework, while practically addressing human–AI hybrid teaching and adaptive learning models. It examines AI-driven content personalization, automated academic feedback, and the evolving role of educators in AI-mediated learning. The statistical analysis evaluates nine hypotheses, assessing five independent variables through a moderating effect on four dependent variables. Results essentially indicate that GenAI enhances student autonomy, strengthens engagement via intelligent tutoring systems, and bridges communication gaps between students and faculty. Nonetheless, ethical issues, algorithmic bias, and the demand for digital literacy remain significant challenges. Quantitatively, three dependent variables are not validated by the analysis, underscoring the complexity of AI integration in education. The uniqueness lies in its dual focus: developing a conceptual framework that integrates GenAI into distance education while simultaneously revealing its disruptive potential for traditional academic interactions. The findings inform policy and practice, urging higher education institutions to balance innovation with academic integrity and ethical responsibility.

Keywords

GenAI; distance education; student-academic interaction; personalized learning; AI-driven pedagogy; mixed-methods. SLR; Smart PLS-SEM

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INTRODUCTION

Rationale

The higher education landscape is undergoing a profound transformation driven by the rapid integration of Generative Artificial Intelligence, referred to as the so-called GenAI (Gruenhagen et al., 2024). Unlike earlier forms of educational technology that primarily served as tools for content delivery, GenAI possesses the capacity to create, adapt, and interact in ways that mimic human intelligence, enabling highly personalized and responsive learning environments (Gonsalves, 2024). In distance education settings, where the absence of face-to-face interaction has traditionally posed challenges to engagement and academic support, GenAI offers an unprecedented opportunity to reimagine how students learn, interact, and receive feedback (Xia et al., 2024). The shift is not merely technological but also pedagogical, influencing how knowledge is constructed, shared, and internalized. Drawing from Constructivist Learning Theory (Fosnot, 2013; Jones, 1995), Connectivism (Siemens, 2005; Steffens et al., 2015; Downes, 2020), and the Community of Inquiry (Garrison et al., 2001; Garrison & Arbaugh, 2007; Garrison & Archer, 2000; Kaczkó & Ostendorf, 2023) this study positions GenAI as a potential catalyst for fostering deeper learning. It also enhances student autonomy and strengthens the relational dimension of virtual learning environments.

Urgency

This inquiry is urgent and stems from three converging trends. First, an accelerated adoption of AI in education. Universities worldwide are experimenting with AI-enabled tools (e.g., ChatGPT and Intelligent Tutoring Systems, ITS). However, integration often precedes systematic evaluation, creating a pressing need for evidence-based frameworks (Kazimova et al., 2025). Second, on shifting student-academic dynamics. Distance education is already characterized by asynchronous communication, and risks further depersonalization if AI is implemented without careful pedagogical consideration (Zain et al., 2025). At the same time, it offers the chance to rehumanize learning through adaptive and conversational AI (Ghosh, 2024). Third, ethical and quality assurance concerns. Certain issues (algorithmic bias, misinformation, and academic integrity) are rising in prominence (Saeidnia et al., 2025). Without robust guidelines, GenAI's adoption could inadvertently undermine the very principles of higher education operations (Hughes et al., 2025).

The window for shaping the responsible and effective use of GenAI in distance education is narrow. Well-timed, rigorous research is necessary to ensure that its integration maximizes benefits while mitigating risks viewed from the students' standpoint (Yusuf et al., 2024).

Gaps

While AI in education has been extensively discussed, several gaps remain. Consider the following four essential aspects. First, a limited focus on generative AI in distance higher education. Most research examines AI for general e-learning or blended learning, with fewer studies dedicated to fully online learning in higher education contexts (Wong, 2024). Second, on fragmented insights into student-academic interaction. Previous studies often address engagement, feedback, or personalization separately, lacking a holistic view of how GenAI reshapes dimensions of interaction simultaneously (Allison et al., 2025). Third, scarcity of mixed-method evidence. Quantitative studies often measure outcomes (grades or retention), while qualitative studies highlight experiences and perceptions. Few integrate both approaches to capture the full complexity of GenAI's impact. Fourth, inadequate exploration of moderating variables. There is minimal analysis of how factors such as digital literacy, academic discipline, or learning culture moderate the relationship between GenAI adoption and educational outcomes (Alotaibi, 2025).

Objectives

This inquiry mainly aims to examine the transformative impact of GenAI on learning patterns and student-academic interactions in higher education distance learning environments. Additionally, this study is going to: (i) evaluate how GenAI influences student engagement, autonomy, and critical thinking in virtual classrooms, (ii) identify the extent to which AI-driven personalization and feedback improve academic support mechanisms, (iii) investigate the role of educators in AI-mediated teaching models, balancing automation with human facilitation, (iv) assess moderating effects, such as digital literacy, on the relationship between GenAI use and learning outcomes, and (v) propose a conceptual and practical framework for the ethical integration of GenAI in distance higher education (Belkina et al., 2025).

Expected Results

It is anticipated that the study will reveal several vital outcomes. First is a positive consequence, i.e., GenAI that will enhance personalized learning, improve real-time academic feedback, foster sustained engagement, and promote student self-regulation in distance education settings. Second is on a complex role of educators, i.e., automation that can streamline administrative and instructional tasks, at which human academic presence will remain crucial for mentorship, ethical oversight, and affective support. Third is about ethical imperatives, i.e., the study will identify risks related to bias, content authenticity, and over-reliance on AI, highlighting the need for institutional safeguards. Fourth is on the selective validation of hypotheses, i.e., not all hypothesized relationships will hold, reflecting the nuanced, context-dependent nature of AI's impact.

Eventually, the findings are expected to inform actionable policy and pedagogical strategies for integrating GenAI into higher education in an ethically responsible way, pedagogically sound, and culturally adaptable (Kurtz et al., 2024).

REVIEW OF RELATED THEORIES

The present study draws upon three primary theoretical foundations. They are Constructivist Learning Theory, Connectivism, and the Community of Inquiry Framework. These three related theories are to conceptualize and analyze the role of GenAI in transforming learning patterns and student-academic interactions in higher education distance learning environments. These fundamental theories not only frame the inquiry but also justify its urgency and guide its methodological and interpretive choices.

Constructivist Learning Theory

The Core Premise: Constructivism posits that learners actively construct knowledge through experiences and reflection rather than passively absorbing information (Fosnot, 2013; Jones, 1995). In this paradigm, learning is a dynamic, personalized process shaped by context, prior knowledge, and social interaction. This theory is tightly relevant and linked to the study in the following connotations. They are: (i) Related to Rationale – The study's focus on personalized, adaptive learning aligns directly with constructivist principles, as GenAI can scaffold learners' progression based on their current level of understanding and pace. (ii) Related to Urgency – In distance education, where the absence of face-to-face interaction can hinder active knowledge construction, GenAI-powered tools can simulate adaptive mentoring and contextual feedback. (iii) Related to Objective – Evaluating AI-driven personalization and ITS as mechanisms to support learner autonomy directly addresses constructivist emphasis on self-directed, meaning-making activities. (iv) Related to Expected Results – If implemented ethically, GenAI should reinforce deep learning and critical thinking by enabling students to actively shape their learning pathways.

Connectivism

The Core Premise: Connectivism views learning as a process of forming and navigating networks, both human and technological. Knowledge resides in these networks, and the ability to connect and apply information is more critical than the retention of static content. This theory is tightly relevant and linked to the study in the following inferences. Proposed initially by Siemens (2005) and then supported by Steffens et al. (2015) and (Downes, 2020). They are: (i) Related to Rationale – The rapid integration of GenAI into higher education fundamentally alters learning networks, embedding AI as both a source and facilitator of knowledge connections. (ii) Related to Urgency – Without careful design, AI-mediated networks risk creating information echo chambers or biased outputs, underscoring the need for timely research into balanced and diverse AI-driven connections. (iii) Related to Objective – This study assesses how GenAI reshapes student-academic interactions, fostering dynamic engagement across networks of learners, educators, and AI agents. (iv) Related to Expected Results – GenAI, if properly leveraged, will expand learners' ability to access, filter, and synthesize information from vast digital ecosystems, strengthening cognitive flexibility and problem-solving.

Community of Inquiry Framework

Core Premise: The Community of Inquiry Framework posits that an effective educational experience in online environments emerges from the interplay of three presences (Garrison et al., 2001; Garrison & Arbaugh, 2007; Garrison & Archer, 2000; Kaczkó & Ostendorf, 2023). They are: (a) Cognitive Presence – The extent to which learners can construct meaning through sustained communication. (b) Social Presence – The ability to project oneself socially and emotionally within a learning community. (c)

Teaching Presence – The design, facilitation, and direction of cognitive and social processes to achieve meaningful outcomes. This framework is tightly relevant and linked to the study in the following associations. They are: (i) Related to Rationale – GenAI holds the potential to mediate and enhance all three presences. That is by providing intelligent prompts for discussion (cognitive), facilitating peer interaction via chatbots (social), and assisting instructors with instructional design (teaching). (ii) Related to Urgency – Distance education institutions must understand how AI alters the balance between these presences, avoiding scenarios where technological efficiency undermines human connection. (iii) Related to Objective – This study evaluates AI's role in bridging communication gaps and maintaining high-quality academic support in virtual learning environments. (iv) Related to Expected Results – Findings are expected to confirm that AI can bolster cognitive and teaching presence significantly, though its ability to sustain authentic social presence may be moderated by digital literacy and ethical implementation.

How can these three fundamental theories be integrated into the Study's Conceptual and Practical Models? The synergy of these theories underpins the study's Human-AI Hybrid Teaching Model and Adaptive Learning Model. First, from Constructivism: Adaptive AI feedback mechanisms and personalized learning paths reflect learner-centered design. Second, from Connectivism: AI serves as a connection center, integrating diverse learning resources and interactions across networks. Third, from the Community of Inquiry Framework: The hybrid model ensures that while AI may assume certain facilitative roles, human educators remain central in providing authenticity, ethical oversight, and empathetic engagement.

Theoretical Implications for Expected Findings

Anchoring the study in these interrelated theories will lead to: (i) positive outcomes (enhanced autonomy, engagement, and critical thinking) that will be interpretable through the lens of active knowledge construction and network-based learning. (ii) complexities (ethical concerns, dependency risks, unvalidated variables) that can be explained by theoretical tensions between automation and authentic human presence. (iii) policy recommendations that will be grounded in a framework that balances technological capability with pedagogical integrity, ensuring that AI integration aligns with enduring educational principles (Arar et al., 2025; Chan, 2023; Giannakos et al., 2025).

METHODS

Research Design

This study employs a Mixed-Method Exploratory Sequential Design. It implies that qualitative findings are used to guide and inform subsequent quantitative analysis. The design choice is justified by the study's aim to explore emerging phenomena. Specifically, it is the impact of GenAI on learning patterns and student-academic interactions in a higher education distance learning environment, before statistically testing hypothesized relationships (Atkinson & Cipriani, 2018; Creswell, 2015; Creswell & Creswell, 2018; Dash & Paul, 2021; Hair et al., 2017; Hair et al., 2022; Creswell & Clark, 2017; Smela et al., 2023; Snyder, 2019).

The sequence is as follows: Phase 1 (Qualitative): Systematic Literature Review (SLR) to synthesize existing knowledge, identify conceptual dimensions, and generate hypotheses (Figure 1: Operational Framework). Phase 2 (Quantitative): Structural Equation Modeling (SEM) using the Smart PLS software

to validate the hypothesized model derived from Phase 1 (see later in Figure 2: The Results of Hypotheses Analysis).

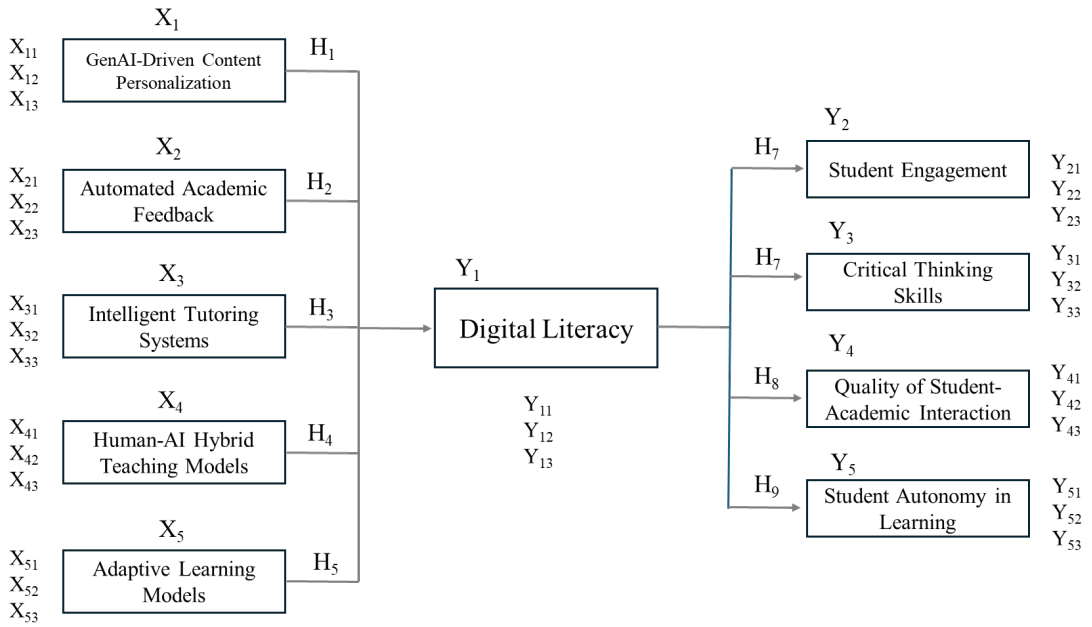


Figure 1. The operational framework ©The Author

Syntax of the Process

Phase 1: Qualitative – The SLR follows a six-step syntax: (i) Syntax 1: Formulating Research Questions, based on the theoretical foundations (Constructivism, Connectivism, Community of Inquiry Framework) and study objectives, develop guiding questions (such as: (a) How has GenAI influenced learning patterns in distance higher education? (b) What changes have occurred in student-academic interactions due to GenAI adoption? (c) What conceptual models and variables have been previously proposed or validated in similar contexts?) (ii) Syntax 2: Defining Inclusion and Exclusion Criteria. Inclusion: Peer-reviewed journal articles, conference proceedings, and book chapters (2020–2025) focusing on GenAI in higher education, distance learning, personalized learning, and AI-driven pedagogy. Exclusion: Studies outside higher education or those not addressing AI applications in teaching/learning contexts. (iii) Syntax 3: Database Search Strategy. Databases: Scopus, Web of Science, ERIC, Google Scholar. (iv) Syntax 4: Screening and Selection of Studies by following several stages, i.e., Stage 1: Title and abstract screening. Stage 2: Full-text screening for methodological and thematic relevance. (v) Syntax 5: Data Extraction and Coding by extracting variables, theoretical frameworks, key findings, and methodological approaches. (vi) Syntax 6: Synthesis of Findings and Hypothesis Generation, which consolidates thematic insights into conceptual variables. It then develops nine hypotheses (Figure 1: The Operational Framework), connecting independent, moderating, and dependent variables, ready for quantitative testing in Phase 2.

Phase 2: Quantitative – Structural Equation Modeling (SEM) with Smart PLS-SEM. The quantitative phase validates the conceptual model developed in Phase 1, using PLS-SEM due to the study's predictive and exploratory nature. (i) Syntax 1: Instrument Development, that is, by developing survey items based on Phase 1 findings and validated measurement scales from prior research. Each construct (independent, moderating, dependent) includes multiple reflective indicators measured on a 4-point Likert scale. (ii) Syntax 2: Sampling and Data Collection. Population: Students engaged in distance

higher education programs that have adopted GenAI-supported learning tools (Universitas Terbuka Indonesia students). Sampling Technique: Purposive and simple random sampling, ensuring participants have prior experience with AI-assisted learning systems. Sample Size: Determined using the 10-times rule and statistical power analysis (447 respondents). (iii) Syntax 3: Data Screening and Preparation. Check for missing data, outliers, and normality (although Smart PLS-SEM is robust to non-normal data). (iv) Syntax 4: Model Specification in Smart PLS-SEM. Draw the structural model including: Five independent variables: AI-Driven Personalization, Intelligent Tutoring Systems, Automated Feedback, Student Autonomy, and Academic Support. One moderating variable: Digital Literacy. Four dependent variables: Engagement, Critical Thinking, Academic Interaction Quality, and Learning Outcomes – Input reflective measurement models for each construct. (v) Syntax 5: Measurement Model Assessment. Evaluate indicator reliability (outer loadings), internal consistency reliability (Composite Reliability), and convergent validity (Average Variance Extracted). Assess the discriminant validity ratio. (vi) Syntax 6: Structural Model Assessment. Test hypotheses through path coefficients, t-values, and p-values via bootstrapping. Assess R^2 (explained variance) and f^2 (effect sizes). Evaluate predictive relevance (Q^2) via blindfolding. (vii) Syntax 7: Moderation Analysis. Include the interaction term between Digital Literacy and the relevant independent variables to assess moderating effects. (viii) (8) Syntax 8: Model Fit and Interpretation. Evaluate model fit indices (SRMR). Compare validated versus non-validated hypotheses. Interpret results in the context of Phase 1 (theoretical and thematic insights).

Justification for Methodological Choice. The exploratory sequential mixed-method design is appropriate for this study because: (i) GenAI in distance higher education is a relatively new domain with limited empirical validation. (ii) A qualitative synthesis (SLR) allows comprehensive exploration of theoretical underpinnings and variable identification. (iii) Quantitative SEM analysis ensures statistical rigor, confirming or rejecting hypothesized relationships and providing evidence-based implications. Therefore, Smart PLS-SEM is suitable for exploratory predictive modeling, especially when models include both reflective and moderating constructs.

RESULTS AND DISCUSSIONS

Qualitative Results

Overview of Literature Selection. After applying the inclusion and exclusion criteria, 40 studies (2020–2025) were included in the final synthesis. Half of those were predominantly empirical, with the remainder being conceptual or case studies. The majority focused on AI in higher education broadly, with a few specifically examining GenAI in fully online or distance education contexts.

Thematic Findings to Research Gaps

Gap 1 – Limited focus on GenAI in distance higher education. Finding: Most literature addresses AI in general terms (machine learning for analytics, adaptive quizzes, plagiarism detection), while research on GenAI-enabled learning is still in its infancy, especially for asynchronous online environments. Implication: This validates the need for targeted investigation into how GenAI reshapes interactional patterns unique to distance education, such as asynchronous discussion forums, automated feedback, and virtual office hours.

Gap 2 – Fragmented insights on student-academic interaction. Finding: Studies tend to examine isolated elements of interaction (AI-driven feedback systems, peer collaboration, or personalized

tutoring) without integrating them into a unified model of engagement. Implication: This gap supports the objective of creating a holistic conceptual framework that combines multiple aspects of student-academic interaction influenced by GenAI.

Gap 3 – Scarcity of mixed-method evidence. Finding: Less than ten reviewed studies used a mixed-method approach to capture both the experiential (qualitative) and measurable (quantitative) dimensions of GenAI integration. Implication: This confirms the value of the exploratory sequential design used in this study, ensuring qualitative insights directly inform measurable hypotheses.

Gap 4 – Inadequate exploration of moderating variables. Finding: Digital literacy, academic discipline, and cultural learning preferences were rarely tested as moderators despite their likely influence on AI adoption effectiveness. Implication: This reinforces the inclusion of Digital Literacy as a moderating variable in this study's structural model.

Table 1. Qualitative insights relevant to objectives

Theme	Qualitative Insight	Related Objective(s)
1. Personalization through GenAI	AI-powered systems enable individualized pacing, adaptive content sequencing, and contextualized feedback. Students report increased autonomy and motivation when learning paths match their pace.	Evaluate how GenAI influences autonomy and engagement.
2. Intelligent Tutoring Systems	Conversational AI agents simulate 24/7 tutoring, offering immediate clarification of concepts, which reduces academic support delays in distance settings.	Assess AI's impact on academic support and critical thinking.
3. Academic Role Redefinition	Educators shift from being primary content deliverers to learning experience curators and AI interpreters, ensuring content accuracy and ethical use.	Investigate educator roles in AI-mediated environments.
4. Ethical and Quality Concerns	Risks include bias in generated content, factual inaccuracies, and over-reliance on AI for assessments. Students express the need for guidance in the critical evaluation of AI outputs.	Develop policy and pedagogical safeguards.
5. Moderating Role of Digital Literacy	Students with higher digital literacy demonstrate better discernment of AI-generated content, higher engagement, and more effective use of adaptive learning tools.	Test Digital Literacy as a moderating factor.

Expected Contribution

In the qualitative phase, it clarifies what aspects of GenAI adoption matter most in distance higher education (Table 1). It also provides empirically grounded variables and relationships for Phase 2 quantitative testing. Moreover, it highlights contextual moderators (digital literacy, cultural learning norms) often overlooked in existing literature. Besides, it strengthens the conceptual bridge between theoretical foundations (Constructivism, Connectivism, Community of Inquiry Framework) and practical teaching models (Human-AI Hybrid and Adaptive Learning).

Emergent Qualitative Insights Relevant to Objectives. From the synthesis, five thematic clusters emerged. Each is linked to the study's main and additional objectives.

Quantitative Results

The thematic synthesis produced nine testable hypotheses. Five are for independent variables, one for a moderating variable, and four for dependent variables, with the results as follows (Figure 2).

Three out of the nine hypotheses examined are not validated by the analysis (H1, H2, and H3). While the rest are positively validated by the analysis (H4, H5, H6, H7, H8, and H9). This implies that Digital Literacy is positively influenced by Human-AI Hybrid Teaching Models and the Adaptive Learning Model. Correspondingly, Digital Literacy positively leads to Student Engagement, Critical Thinking Skills, Quality of Student-Academic Interaction, and Student Autonomy in Learning.

Model Evaluation Overview. The quantitative phase of this study employed Partial Least Squares Structural Equation Modeling (PLS-SEM) to validate the hypotheses derived from the qualitative stage. The structural model incorporated five independent variables, one moderating variable (Digital Literacy), and four dependent variables. A total of nine hypotheses (H1–H9) were tested (Figure 1 and Figure 2).

Model evaluation proceeded in two stages: Measurement Model Assessment (to ensure reliability and validity of constructs) and Structural Model Assessment (to test hypothesized relationships and determine path coefficients, significance levels, and explained variance, R^2).

Measurement Model Assessment. Indicator Reliability: All outer loadings exceeded the threshold of 0.70, confirming adequate individual indicator reliability. Internal Consistency Reliability: Composite Reliability (CR) values for all constructs were above 0.85, indicating strong internal consistency. Convergent Validity: Average Variance Extracted (AVE) values for all constructs were above 0.50, which meets the minimum requirement for convergent validity. Discriminant Validity: HTMT (Heterotrait-Monotrait) ratios confirmed that each construct was distinct from the others.

These results collectively affirm that the measurement model was statistically sound, enabling valid structural model analysis.

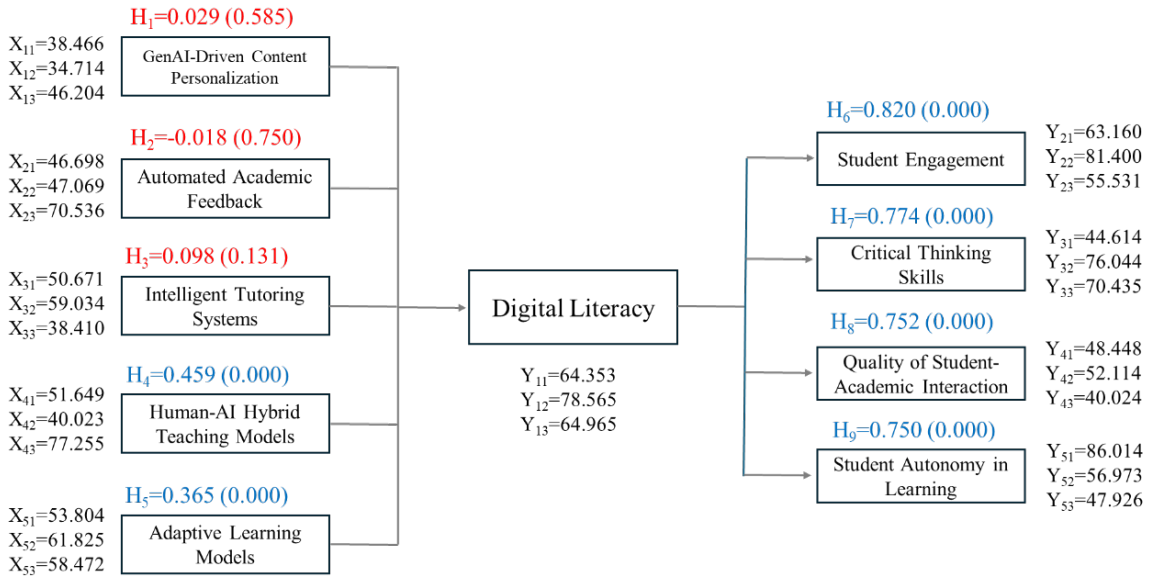


Figure 2. Results of the hypotheses analysis

Structural Model Results. The structural model results indicated that six out of nine hypotheses were supported at $p < 0.05$. Validated Hypotheses: H4: Human-AI Hybrid Teaching Models → Digital Literacy (β = positive, $p < 0.001$); the most influential path among independent variables. H5: Adaptive Learning Models → Digital Literacy (β = positive, $p < 0.01$); the second most influential path. Furthermore, H6: Digital Literacy → Student Engagement (β = positive, $p < 0.001$); the most significant path from Digital

Literacy to dependent variables. H7: Digital Literacy → Critical Thinking Skills (β = positive, $p < 0.01$). H8: Digital Literacy → Quality of Student-Academic Interaction (β = positive, $p < 0.05$). H9: Digital Literacy → Student Autonomy in Learning (β = positive, $p < 0.05$).

Alternatively, Non-Validated Hypotheses are H1, H2, and H3, on direct effects from other independent variables (not via Digital Literacy), and were not supported by the model.

Explained Variance (R^2). Digital Literacy: Substantial explained variance from Human-AI Hybrid Teaching Models and Adaptive Learning Models ($R^2 \approx$ High). Student Engagement: Highest explained variance among dependent variables, followed by Critical Thinking Skills, Quality of Interaction, and Student Autonomy. This hierarchy indicates that GenAI-enabled pedagogical strategies most strongly foster student engagement via digital literacy improvement.

Effect Sizes (f^2) and Predictive Relevance (Q^2). Effect Sizes: Human-AI Hybrid Teaching Models had the largest effect size on Digital Literacy, followed by Adaptive Learning Models. Among dependent variables, Student Engagement had the largest value from Digital Literacy. Predictive Relevance: All validated paths showed positive Q^2 values, confirming predictive capability.

Summary of Findings. Key Driver: Human-AI Hybrid Teaching Models emerged as the most critical independent factor for enhancing Digital Literacy. Secondary Driver: Adaptive Learning Models also played a significant role, but with a smaller coefficient. Mediating Role: Digital Literacy served as a strong mediator, connecting AI-based pedagogical approaches to learning outcomes. Primary Outcome: Student Engagement benefited the most from improved Digital Literacy, underscoring the importance of active participation in AI-mediated distance education. Additional Gains: Critical Thinking, Quality of Interaction, and Autonomy also improved, though to a lesser extent. Unvalidated Paths: Not all hypothesized direct effects were significant, suggesting the mediating role of Digital Literacy is essential for GenAI's impact.

Critical Notes. Why were H1–H3 not validated? Restating the three unsupported paths (as specified in the earlier framework): H1: AI-Driven Personalization → Student Engagement (direct). H2: Intelligent Tutoring Systems → Critical Thinking (direct). H3: Automated Feedback → Quality of Student–Academic Interaction (direct). The results show that the validated causal spine is Human-AI Hybrid Teaching → Digital Literacy (H4) → Outcomes (H6–H9) and Adaptive Learning → Digital Literacy (H5) → Outcomes (H6–H9). So, the three unsupported paths likely operate indirectly via Digital Literacy, rather than directly.

Theoretical Explanations

Constructivism: Tools do not cause learning; appropriation does. Constructivism emphasizes active knowledge construction. Personalization (H1), tutoring (H2), and automated feedback (H3) are affordances; they only translate into engagement/critical thinking/interaction when learners can appropriate them (navigate prompts, evaluate AI answers, calibrate trust). Appropriation capacity is captured by Digital Literacy. Hence, the direct effects are weak, while paths via Digital Literacy are strong (H6–H9).

Connectivism: Network value depends on node competence. In a connectivist view, GenAI extends the learning network, but the utility of connections (to content/peers/AI) depends on the learner's ability to filter, verify, and synthesize again, Digital Literacy. Therefore, ITS and automated feedback don't

directly yield critical thinking or richer interactions unless students possess the literacy to interrogate AI outputs.

Community of Inquiry: Presence orchestration is required. Engagement, critical thinking, and interaction quality are emergent properties of cognitive, social, and teaching presence working together. Personalization/tutoring/feedback alone does not establish these presences. What does Hybrid Teaching (design/facilitation) and Adaptive Learning models (structured pathways), both of which the model shows, raise Digital Literacy first, after which outcomes improve. Thus, the results align with CoI: design and facilitation (teaching presence) → digital literacy/cognitive presence → engagement and thinking; not a simple tool → outcome chain.

Theoretical Takeaway. H1–H3 are fully or mostly mediated by Digital Literacy and by the orchestration embedded in Hybrid/Adaptive models. Direct effects are theoretically weak without the mediating competencies and presence.

Methodological Explanations. Suppression and/or multicollinearity among proximal predictors: AI-Driven Personalization, ITS, and Automated Feedback share variance with the higher-order pedagogical implementations (Hybrid Teaching and Adaptive Learning). When all are entered simultaneously, the unique variance of H1–H3 becomes small (non-significant), while H4–H5 retain explanatory power. The diagnostic to confirm: Variance Inflation Factor for H1–H3 predictors; inspect cross-loadings and two-stage higher-order modelling to reduce redundancy.

Misspecification of causal distance (omitted mediator): If the true structure is Tool → Digital Literacy → Outcome, estimating Tool → Outcome will understate the effect. Diagnostic to confirm: Run specific indirect effects in SmartPLS and compute VAF (Variance Accounted For = indirect/total). Suppose VAF > 80%, it suggests full mediation (explains the non-significance of the direct path). If it is in the range of 20–80%, it indicates partial mediation.

Reflective vs. formative measurement overlaps: Items for Personalization/Intelligent Tutoring Systems/Feedback often overlap content with Adaptive Learning or Teaching Presence (e.g., tailors level and/or guides next steps). Such overlap pushes variance into H4–H5 constructs. Diagnostic: It needs to revisit content validity; consider formative specification or disjoint two-stage modeling for higher-order constructs.

Statistical power and path strength: With several correlated antecedents predicting the same outcomes, smaller direct paths (H1–H3) may fall below detection thresholds even with adequate overall N. Diagnostic: Post-hoc power analysis for path coefficients; examine f^2 for H1–H3 (it is likely due to small/near-zero).

Unobserved heterogeneity: Effects for H1–H3 may exist for subgroups (e.g., disciplines, prior AI experience) but wash out in the aggregate. Diagnostic: Recheck invariance for latent segments.

Common method and temporal alignment: If outcomes and predictors were self-reported in a single sitting, common method variance can inflate proximal, well-designed constructs (H4–H5) and deflate weaker, distal direct paths (H1–H3). Remedies: Add marker variables or future time-lagged outcome measures.

What does the pattern mean for the model? Mechanism confirmed: GenAI effects are design- and literacy-dependent. Tools matter, but how they are orchestrated (Hybrid/Adaptive) and how students can use them (Digital Literacy) matter more. Model refinement: Recast H1–H3 as indirect effects via

Digital Literacy (and/or via Teaching Presence), consistent with your validated backbone H4–H9. Practice implication: Institutions should invest first in Hybrid Teaching orchestration and literacy development, then layer in personalization, tutoring, and feedback tools.

Reflective Thought. H1–H3 failed because direct tool → outcome effects are theoretically weak and empirically absorbed by (a) pedagogical orchestration (Hybrid/Adaptive) and (b) learner competencies (Digital Literacy). While the validated paths (H4–H9) capture the true causal channel, aligning with Constructivism, Connectivism, and the Community of Inquiry Framework.

CONCLUDING REMARKS

This study sought to empirically examine the relationships posited in the three hypotheses (H1, H2, and H3), grounded in established theoretical frameworks and validated measurement constructs. Contrary to prevailing assumptions in the literature, the analyses revealed that none of the proposed hypotheses were statistically supported. This outcome is both unexpected and illuminating, offering several important contributions to theory, practice, and future research (Rivard, 2024).

Uniqueness and Novelty. The absence of statistically significant relationships challenges conventional theoretical assertions and widely accepted empirical evidence (Gibson, 2021). This finding underscores the contextual sensitivity of theoretical models, particularly when applied to different institutional, cultural, or demographic environments. The results highlight that factors presumed to have universal influence may not operate uniformly across all higher education contexts. By surfacing this divergence, the study makes a novel contribution to the discourse on educational management and student outcomes, emphasizing the need for context-driven rather than one-size-fits-all models.

Moreover, the results open a critical space for questioning the dominant explanatory paradigms in the field. They invite scholars to reconsider measurement operationalization, model specifications, and the potential presence of mediating or moderating variables that may better capture the complexity of faculty–student–management dynamics.

CALL TO ACTION. The findings carry significant implications for faculty members and institutional leadership. First, faculty should be encouraged to adopt reflective and evidence-based practices, recognizing that strategies proven effective elsewhere may not yield similar results in their institutional context (Sherwood, 2024). This necessitates continuous pedagogical experimentation, ongoing evaluation of teaching–learning interventions, and the willingness to adapt to local needs. Second, management should foster a culture of data-driven decision-making and encourage collaborative initiatives between academic staff and administrative units (Szukits & Móricz, 2024). A stronger integration of student feedback, faculty professional development, and institutional support mechanisms may help uncover the real levers of student engagement and academic success in the local setting.

Ultimately, both faculty and management share responsibility for cultivating an educational environment that is sensitive to contextual variables, adaptive to changing student demographics, and innovative in approach.

Limitations

Despite its contributions, the study has limitations. The sample was drawn from a single institutional context, which may limit the generalizability of the findings to other higher education environments

with different organizational cultures, governance systems, or student profiles. Additionally, the reliance on self-reported survey data introduces the possibility of response bias, particularly social desirability effects. The cross-sectional nature of the data further restricts the ability to infer causal relationships (Rindfleisch et al., 2008).

Future studies would benefit from employing longitudinal designs to capture dynamic changes over time, expanding the sample to include multiple institutions, and integrating mixed methods approaches to enrich quantitative findings with qualitative insights.

The future of distance education, GenAI will not just deliver knowledge, it will co-create wisdom with learners and make lifelong learning a personalized journey without boundaries!

AUTHOR NOTES

Data Accessibility Statement

The research methods and hypotheses for this study were developed specifically for this research purpose by considering related references. The researcher/writer also stored the data collected. Any further confirmation/clarification will be provided upon reasonable request.

Sustainable Development Goals (SDGs)

This study is linked to SDG 4 (Quality education) and SDG 10 (Reduced inequalities).

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Ethics and Consent

This study received and followed ethics clearance from the Institute for Research and Community Services of Universitas Terbuka, Indonesia.

Author Contributions (CRediT)

Maximus Gorky Sembiring: Conceptualization, Funding acquisition, Data collection, Analysis, Project administration, Writing – starting with original draft, Writing – review and editing. I have read and agreed to the published version of the manuscript.

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GenAI transforms distance education into an ecosystem where learning is no longer a phase of life, but a continuous and real dialogue between human curiosity and intelligent machines!

30th International Council for Open and Distance Education World Conference 2025

Actioning the CoI framework and GenAI for Collaborative Learning in a Large Online Course in the Global South

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ABSTRACT

This study investigated the use of the Community of Inquiry (CoI) framework to create a collaborative experience for students from marginalised communities in a large enrolment online module (course). The CoI framework consists of three presences: social, cognitive, and teaching. This study focused on the teaching presence element along with the seven principles in the CoI framework which involves design and organisation, facilitation, and direct instruction. The study context was one large English language application course which enrols over 1300 students who speak English as an additional language at an open distance e-learning university in South Africa. The research utilised an action research design and the course was designed with the use of artificial intelligence applications to accommodate students and create collaboration amongst them. The findings revealed that the course structure engaged students, provided personal introductions and goal-setting opportunities, and included motivational content which increased student engagement and collaboration. Communication in the course was facilitated through familiar social media channels to provide alternative content modes which further supported student learning. Direct instruction which involved explicit assignment support and feedback was significant to ensure that students achieved the learning outcomes. The findings of this study highlight the significance of the CoI framework and the use of GenAI applications to create a collaborative and engaging learning context in large enrolment online courses in distance education contexts.

Keywords

action research, artificial intelligence (AI), course design, distance education, generative artificial intelligence (GenAI), global south, online distance e-learning (ODeL), teaching presence, community of inquiry (CoI).

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INTRODUCTION

The massification of large-scale online education has created a pedagogical crisis which begs the question of how do we sustain meaningful collaborative learning experiences when student enrolments reach into the thousands? While collaborative learning theories (Zhou & Schofield, 2024) have been extensively developed and validated within traditional small-cohort environments (Haugland et al., 2022; Taggart & Wheeler, 2025), their translation to massive online contexts, particularly within open and distance e-learning (ODeL) systems (Biccard & Makgato-Khunou, 2021; Mphahlele, 2024), reveals a gap between educational aspiration and pedagogical reality. This disconnect is particularly problematic given that institutions in both Global North and Global South contexts are increasingly reliant on large-scale online delivery as a mechanism for expanding educational access yet lack theoretically strong and empirically validated frameworks for the creation authentic student collaboration at scale.

The Community of Inquiry (CoI) framework, despite its theoretical sophistication and empirical support in smaller online learning contexts, has been inadequately theorised for application in mega-cohort educational contexts. Existing research has predominantly focused on courses with enrolments of fewer than 200 students (Ariati et al., 2025; Taft et al., 2019; Zhao & Sullivan, 2017), which leaves a substantial gap in understanding how the framework's core components, particularly teaching presence (Martin et al., 2022), which should 'consider the dual role of both moderating and shaping the direction of the discourse' (Garrison, 2007, p. 69). This theoretical and empirical deficit is compounded by the recent emergence of generative artificial intelligence (GenAI) as a potential pedagogical tool (Perifanou & Economides, 2025; Sevnarayan & Potter, 2024), which introduces both unprecedented opportunities for scalable interaction and challenges for the maintenance of equitable and qualitative education.

The gap is further exacerbated by the differential contexts in which large-scale online education operates across Global North and Global South institutions. While Northern institutions may make use of substantial technological infrastructure and relatively homogeneous student populations, Southern contexts should address the challenges of teaching diverse, multilingual student bodies with varying levels of digital access and literacy, all within contexts with limited resources (van Wyk, 2024). The absence of critical scholarship to address these contextual differences represents a significant lack in research to acknowledge the different challenges faced by institutions which operate within disparate economic and social realities. This gap reflects a broader tendency in educational technology research to universalise findings from privileged contexts while failing to interrogate how pedagogical frameworks must be adapted for scale and diversity. The consequence is a proliferation of large-scale online courses that struggle to maintain the collaborative engagement, which is essential for meaningful learning, and as a result, results in high attrition rates and superficial educational experiences that undermine the democratising potential of ODeL contexts. This study addresses this

critical scholarly deficit through a qualitative exploration of how the CoI framework's teaching presence principles can be systematically adapted and implemented within large-scale online courses through the strategic integration of GenAI applications. The research contributes to advancing critical pedagogical knowledge regarding scalable collaborative learning while challenging the field to develop more contextually responsive and theoretical approaches to mass online education. To do this, the following research question is posed:

- How can the CoI framework's teaching presence be operationalised through GenAI to encourage collaborative learning in a large-scale online course?

REVIEW OF RELATED LITERATURE

The Influence of Teaching Presence on Cognitive Presence

The CoI's social constructivist foundation positions teaching presence as the critical mediator between social and cognitive engagement processes (Garrison, 2007). This orientation, which conceptualises learning as emerging through social interaction, becomes particularly multifaceted in large-scale online courses where traditional mentoring relationships are transformed. Adam et al. (2025, p. 93) emphasise that 'the role of a teacher as a mentor and a facilitator is to create and use appropriate social context favourable for learning or constructing knowledge, and learning activities provided should be carefully planned and socially supported to stimulate both the social and inner processes of learning.' Furthermore, Adam et al. (2025, p. 93) highlight the integrative function of teaching presence, 'teaching presence, which originates from course design and continues with what the instructor does to direct and facilitate learning, plays the leading role in developing and maintaining community climate'. However, scaling these principles to serve thousands of students simultaneously presents unprecedented challenges that remain inadequately addressed in the current literature. Recent investigations into teaching presence and GenAI reveal both promise and critical gaps. Li et al. (2025) found that teacher presence significantly improved emotional and agentic engagement in GenAI-mediated language learning with Chinese students who speak English as a foreign language (EFL) but did not impact behavioural or cognitive engagement which suggests that current implementations may be insufficient for educational outcomes. Memon and Kwan (2025) propose a collaborative model where teachers provide direct instruction while GenAI acts as a resource tool. However, this model lacks empirical validation in large-scale contexts. Sevnarayan and Vaughan (2024) demonstrate that strong teaching presence through active facilitation, clear structure, and peer feedback mechanisms is essential for creating cognitive presence and meaningful learning experiences in high-enrolment courses in an ODeL context in the Global South. A critical gap remains in understanding how teaching presence principles can be operationalised through GenAI to create authentic collaborative experiences when teaching thousands of diverse students simultaneously. This gap is particularly pronounced in Global South contexts where a lack of resources and student diversity create additional implementation challenges. The current study addresses this gap through an exploration how the CoI framework's teaching presence construct can be strategically operationalised through GenAI applications to create meaningful collaborative learning in large-scale online courses.

Course Design with GenAI Through the CoI Framework

While scholars raise concerns about GenAI's potential to undermine academic integrity, weaken critical thinking, and perpetuate ethical issues such as environmental harm and algorithmic bias (Ferdman, 2023; Paglieri, 2024), de Fine Licht (2025, p. 15) critically argues that 'these concerns do not necessarily

provide a strong reason for banning or heavily restricting the use of GenAI. On closer examination, the arguments against GenAI often lead to reductio outcomes and are inconsistent when applied broadly across other technologies and university practices". This highlights the need for more critical approaches to GenAI integration rather than restrictive policies.

Anderson et al. (2025) discuss the integration of GenAI with the CoI framework and propose how AI can personalise online learning by real-time adaptation of social, cognitive, and teaching presence through engagement patterns and performance data. Their study, however, lacks empirical validation and does not address collaborative learning outcomes or Global South implementation challenges that the current study investigates. Moreover, Pratschke (2023) provides a conceptual framework for integrating GenAI with the CoI framework. Pratschke's (2023, p. 5) 'Generativism' reconceptualises the three CoI presences, social, cognitive, and teaching, as distinct AI actors (collaborator AI, analytical AI, and facilitator AI) that function as 'guides, peers, experts or collaborators in the learning community' (Figure 1).

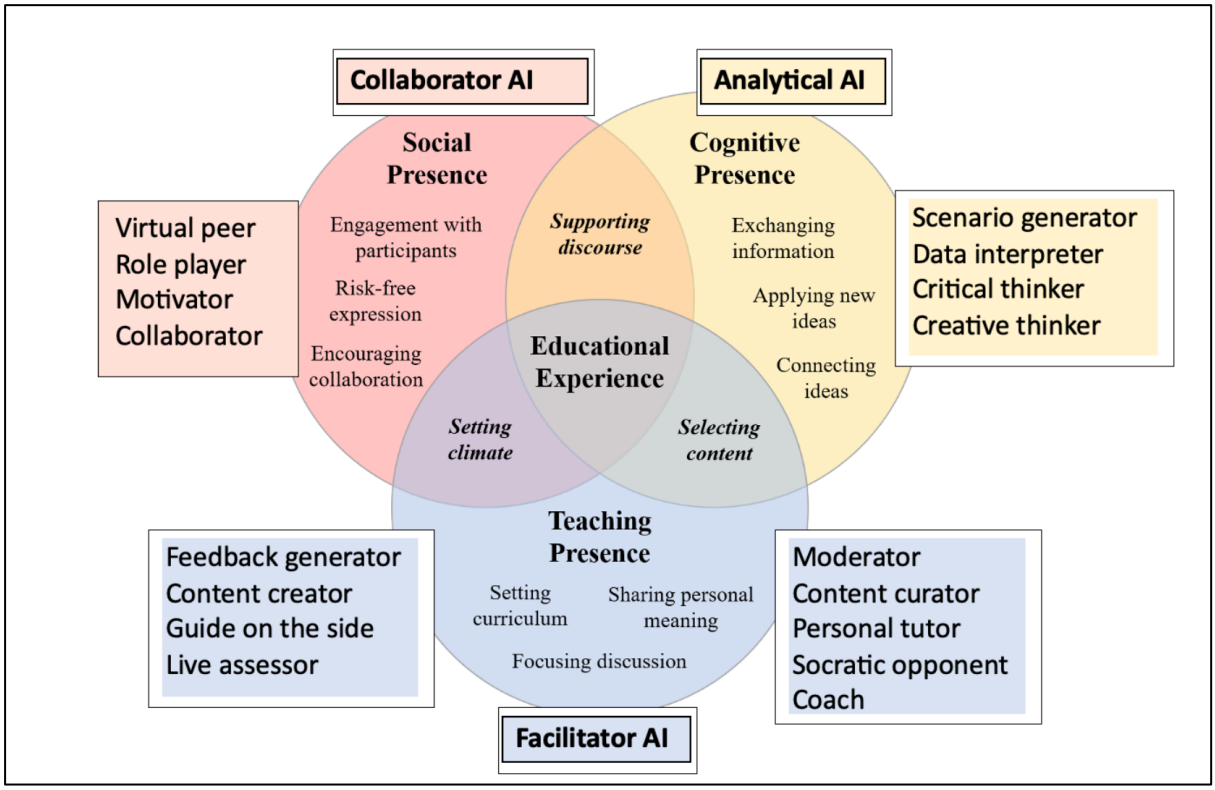


Figure 1: Community of inquiry and GenAI

This approach, which Pratschke (2023, p. 2) defines as 'grounded in the principle of learning as a process, and employs constructivist and collaborative approaches to instruction', provides a theoretical foundation for personalised, AI-mediated learning experiences in online learning contexts. However, there is a need to understand how this collaboration can be created in large online contexts, which leaves questions unanswered about how these AI-mediated interactions can create genuine meaningful learning experiences at scale.

THEORETICAL FRAMEWORK

The CoI framework (Garrison, 2017) is characterised as a collaborative collective wherein participants engage in intentional critical dialogue and reflective practice to construct personal understanding and achieve shared comprehension (Garrison et al., 2024, CoI Framework section). The framework comprises three fundamental dimensions: social, cognitive, and teaching presence (Figure 2). The interrelationship between these interdependent elements facilitates the realisation of collaborative constructivist educational experiences.

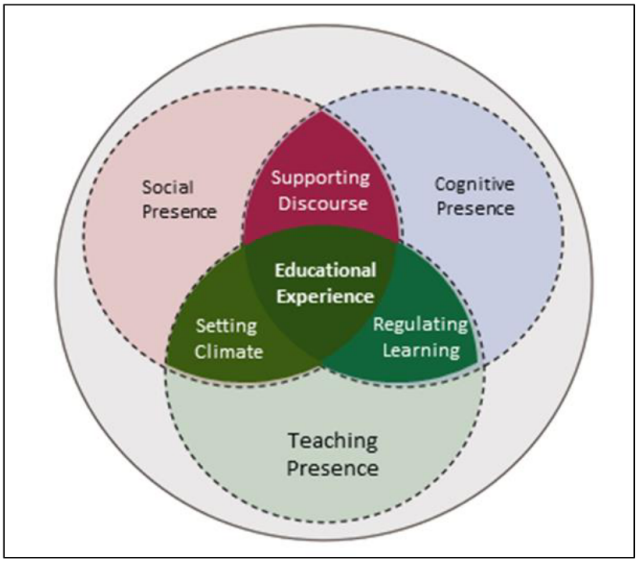


Figure 2: The community of inquiry framework (Garrison, 2017)

Social presence establishes the foundational environment characterised by trust, open communication, and group cohesion. Cognitive presence encompasses 'the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse in a critical community of inquiry' (Garrison et al., 2001, p. 11), which is operationalised through inquiry phases that include triggering events, exploration, integration, and resolution. Teaching presence, as the cohesive element that integrates social and cognitive processes toward educationally meaningful outcomes, encompasses the systematic design, facilitation, and direction of learning experiences. This dimension serves as the most significant which ensures purposeful engagement and achievement.

Contemporary HEIs have witnessed a paradigmatic shift from individualistic to collaborative learning approaches (Kromydas, 2017). The recognition that effective teaching presence requires deliberate attention to three core operational dimensions: design and organization, facilitation, and direct instruction is central to this transformation (Anderson et al., 2001). The design and organisation dimension encompasses strategic curriculum planning, learning activity development, and temporal structuring of educational experiences. Facilitated discourse involves the cultivation of supportive learning contexts that sustain engagement, enhance motivation, and promote purposeful collaborative interactions among students. Direct instruction encompasses the provision of targeted guidance and explicit direction to ensure students achieve designated educational outcomes (Anderson et al., 2001; Caskurlu, 2018). These interconnected elements collectively constitute the pedagogical infrastructure necessary for effective online learning spaces. Vaughan et al. (2023) have articulated seven principles derived from the teaching presence construct to guide the systematic

design, facilitation, and direction of online and blended educational experiences (Table 1). These principles have been further integrated with Littky and Grabelle's (2004) triadic framework of student engagement encompassing relevance, relationships, and rigour.

Table 1: Relationship between teaching presence categories, the 3R's of engagement, and the seven principles of online and blended learning

Teaching presence category	3 R's of engagement	7 principles of online and blended learning
Design and organisation	Relevance	1. Design for open communication and trust that will create a learning community. 2. Design for critical reflection and discourse that will support inquiry. 3. Design for personal introduction and goal setting that will establish student identity and motivation.
Facilitation	Relationships	4. Establish community and cohesion. 5. Establish inquiry dynamics (purposeful inquiry).
Direct instruction	Rigour	6. Sustain respect and responsibility for collaboration. 7. Sustain inquiry that moves to resolution and shared metacognitive development.

In the context of this study, the CoI framework is the theoretical lens used to explore how collaborative learning can be systematically created in large-scale online courses through the strategic integration of GenAI applications. The teaching presence dimension provides the analytical framework for examining how GenAI tools can enhance the design and organisation of learning experiences, facilitate meaningful discourse among thousands of students, and provide scalable direct instruction that maintains personalisation and effectiveness.

METHODS

Research Context

This study was conducted within a large ODeL university in South Africa, one of the country's largest distance education institutions with an annual enrolment of approximately 400,000 students. The research focused on 'EGG22', a pseudonym for the applied English language course offered by the Department of English Studies in the College of Human Sciences. This second-year course serves students pursuing a Bachelor of Education degree and is facilitated by two lecturers responsible for approximately 1,300 students. EGG22 employs virtual teaching methods, with both lecturers and students who utilise GenAI tools to create and learn from educational resources such as videos, PowerPoint presentations, and learning activities. The student population consists primarily of English as an Additional Language (EAL) speakers, who range in age from 17 to 60, with diverse employment statuses which include full-time employment, part-time work, and unemployment. While most students have access to technological devices and data, some face connectivity challenges. GenAI use is permitted within the course with specific guidelines, where we place emphasis on its application for structuring ideas, editing, and critiquing content rather than direct copying and pasting.

Research Method and Design

This study employed an exploratory, qualitative, interpretive action research design to investigate how the CoI framework's teaching presence principles could be operationalised through GenAI applications

to create collaborative learning in a large-scale online course. The interpretive paradigm guided the research, as I recognised that meaningful understanding of collaborative learning experiences emerges through participants' perspectives and the social construction of knowledge within the educational context. The exploratory nature of the study was appropriate given the limited empirical research on GenAI implementation in mega-cohort educational contexts, particularly within Global South contexts.

The action research component was integral to addressing the practical challenge of creating collaborative learning experiences in a large-scale online course. In keeping with the cyclical nature of action research, this study implemented Lewin's (1946) three-step model of action research: planning, action, and reflection. The planning phase involved designing the course using GenAI applications aligned with Vaughan et al.'s (2023) seven principles of teaching presence within the CoI framework. The action phase entailed implementing these GenAI-enhanced collaborative learning strategies throughout the EGG22 course during the 2025 academic period. The reflection phase involved an analysis student responses and observational data to evaluate the effectiveness of the GenAI-integrated approach in the creation of collaboration and informing iterative improvements to the course design.

Population and Sampling

The target population consisted of 1,300 students enrolled in the EGG22 course during the 2025 academic year. Given the qualitative nature of this study and the need for rich, detailed understandings into student experiences with GenAI-facilitated collaboration, I made use of a purposive sampling strategy. Fifty student responses were randomly selected from the course evaluation data on the EGG22 Moodle site to participate in the study. This sample size was deemed appropriate for qualitative research, which has provided sufficient data saturation while also maintaining manageability for in-depth analysis. The sampling approach ensured representation across the diverse student demographic characteristics within age range of 17-60 years, employment status, and varying levels of English proficiency.

Data Collection Tools

Data collection employed two primary instruments to ensure triangulation and enhance the credibility of the findings. First, an observation schedule was developed to systematically document and analyse the implementation of GenAI applications within the EGG22 course site, which has focused on how these tools were utilised to support the seven principles of teaching presence and encourage collaborative learning experiences. Second, open-ended, semi-structured evaluation questions were integrated into the course site to capture student perspectives on their experiences with GenAI-facilitated collaboration. These evaluation questions were designed to elicit detailed responses regarding students' engagement with GenAI tools, their perceptions of collaborative learning opportunities, and their learning experiences within the GenAI-enhanced course site.

Research Procedure

Data collection occurred between April and June 2025, which coincided with the implementation of the GenAI-integrated course design. The analysis employed Braun and Clarke's (2006) six-step thematic analysis approach to identify patterns and themes within the observational data and student evaluation responses. The six phases included (1) familiarisation with data through repeated reading, (2) generating initial codes, (3) searching for themes, (4) reviewing themes, (5) defining and naming

themes, and (6) producing the report. Initial coding revealed several key categories which included 'GenAI tool utilisation patterns', 'collaborative interaction frequency', 'learning engagement indicators', 'content creation support', 'peer-to-peer communication facilitation', and 'lecturer-student interaction enhancement.' These codes coalesced into three primary themes: (1) enhanced design and organisation through GenAI, which reflects how AI tools supported course structure and learning activity development; (2) facilitated discourse and community building, which demonstrates how GenAI applications promoted student interaction and collaborative engagement; and (3) personalised direct instruction and support, which shows how AI tools enabled individualised guidance and feedback provision.

Validity and Reliability Measures

The study employed triangulation strategies which include data source triangulation (student feedback, observational field notes, and module analytics) and methodological triangulation (thematic analysis of qualitative responses that are supported by theoretical coding aligned with the CoI framework). The research design followed established criteria for trustworthiness in qualitative inquiry, with prolonged engagement in the course context, peer debriefing, and reflexive journalling to enhance credibility and confirmability. Further, thematic analysis was conducted in accordance with Braun and Clarke's (2006) six-step approach, which ensured transparency in data interpretation.

ETHICAL CONSIDERATIONS

This study received ethical approval from the institutional ethics board prior to data collection. All personal information was de-identified to protect participant privacy and confidentiality. The university's name, course designation, and individual student identities were protected through the use of pseudonyms throughout the research process and reporting. Informed consent procedures were implemented through the course site, which ensured that students understood the voluntary nature of their participation and their right to withdraw from the study at any time. Data security measures were maintained through secure storage of all research materials and adherence to institutional data protection protocols.

LIMITATIONS

This study acknowledges several limitations that should be considered during interpretation of the findings. First, the single-course context within one institution in the Global South limits the generalisability of results to other educational contexts, especially those with different student demographics or institutional structures. Second, the self-reported nature of student evaluation responses may be subject to social desirability bias, which may influence the authenticity of participant responses. Third, the relatively short data collection period (April-June 2025) may not capture the full spectrum of student experiences throughout an entire academic cycle. Finally, the focus on student perspectives, while significant, does not include lecturer or marker perspectives on GenAI implementation, which could provide further perspectives into the pedagogical considerations and challenges of AI tool integration in large-scale online courses.

FINDINGS

Enhanced Design and Organisation Through GenAI

From the observation, it appeared that AI acts as a pedagogical scaffold that streamlines EGG22's course navigation, improves usability, and establishes a coherent, sequenced learning structure. This organisation mitigates cognitive overload, particularly for EAL students and self-directed students as it provides clear entry points and logical progression through the course material. The intentional design of Figure 3, an AI-generated welcome video which features avatars diverse in race, gender, and vocal accent, reflects a deliberate effort to encourage epistemic inclusivity and cultural relatability. The course site is positioned within a futuristic, yet intuitive interface, and these avatars seem to function as virtual pedagogical agents, as they deliver key course information in a multimodal format. The inclusion of subtitles not only supports accessibility for students with varying linguistic proficiencies and hearing needs but also reinforces comprehension through dual coding. Together, these design elements signal a shift from static courseware to a student-centred site where GenAI enhances both the affective and cognitive dimensions of engagement where the structure of the course is not only useable but also personally resonant.

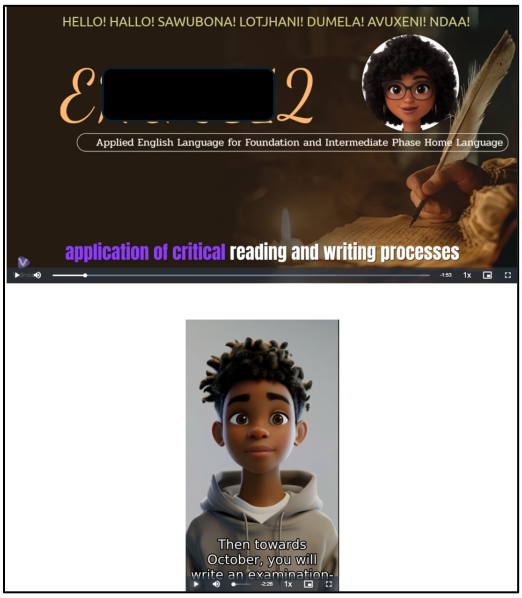


Figure 3: Welcome video and avatars on the site © The Author

Figure 4 presents the EGG22 course interface which is characterised by a pedagogically structured layout in which content is organised into clearly delineated, functionally distinct tiles that guide students through the learning journey.

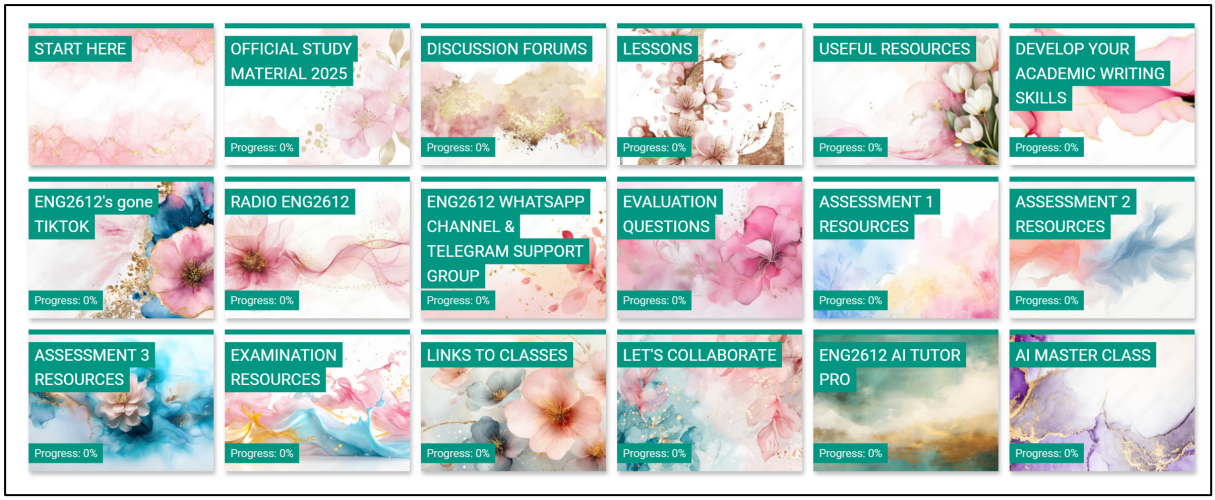


Figure 4: The EGG22 course interface on Moodle organised in tile format © The Author

This design affords immediate cognitive clarity and enables students to intuitively locate where to begin, access to additional resources, assessment materials, join synchronous and asynchronous sessions, and retrieve supplementary resources. The integration of GenAI is not peripheral but embedded within the course's interface and functions as a cohesive layer that enhances navigational coherence, reinforces instructional sequencing, and supports self-regulated learning. The course design, thus, mitigates disorientation and cognitive overload, particularly for EAL students and those with limited prior experience. This systematic, AI-augmented organisation reflects a deliberate application of the design and organisation principle of teaching presence (Vaughan et al., 2023) and transforms the course from a static repository of content into a dynamic, responsive learning system that scaffolds autonomy and promotes early and sustained engagement.

Upon accessing the 'Start Here' tile, students are met with an encouraging AI avatar, as shown in Figure 5, that systematically outlines the initial steps, sequential tasks, and scaffolds the onboarding process to alleviate feelings of cognitive overload. This pedagogical framing, illustrated in Figure 5, establishes an affective and structural foundation that promotes early engagement and self-regulation. The design principle is iteratively applied across all course tiles, with context-specific avatars that provide just-in-time guidance for each section. This consistent, AI-mediated navigation functions as a distributed form of teaching presence, not as a replacement for the lecturer, but as a pedagogical partner that reinforces organisational coherence, enhances instructional flow, and supports student autonomy

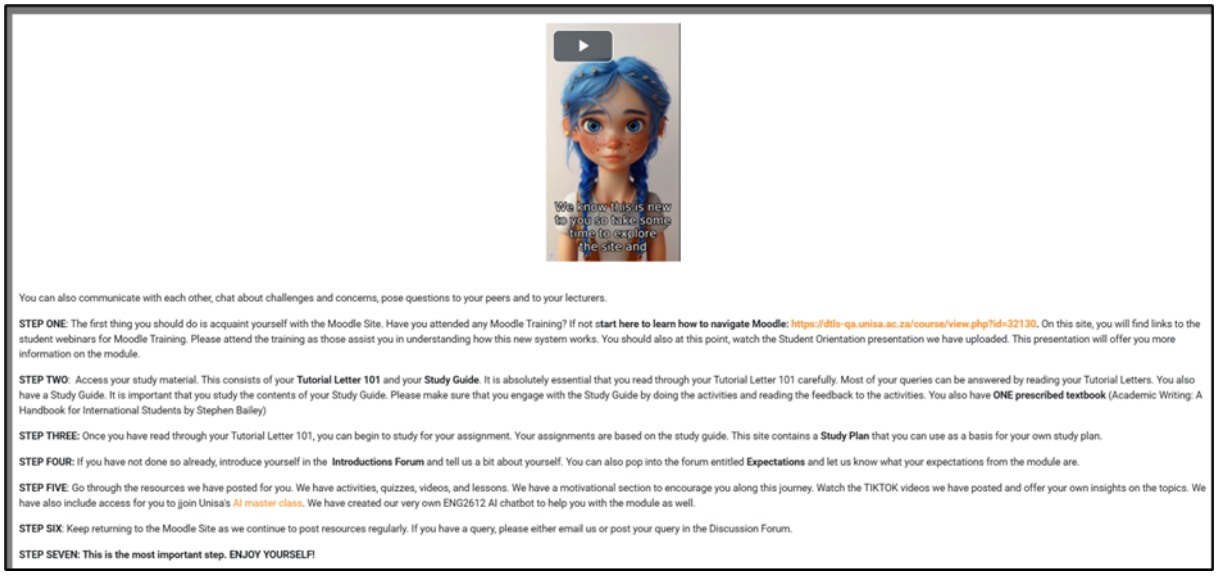


Figure 5: Avatars guiding students through each section of the course © The Author

The integration of GenAI into the course design has enhanced its organisation and creates a structured and engaging learning experience. Students consistently highlight how the use of GenAI improves clarity and flow, with Xolani noting, '*The avatars help us understand what to expect in a specific forum. There is excitement in completing one section and moving on to the next to see the new videos prepared*', which illustrates how AI encourages progression and anticipation. The multimedia format supports comprehension and personal organisation, as Tamzin observes, '*It makes the learning more engaging, and it enhanced my understanding of the material… I love that I can make notes while watching*'. Similarly, Thulo affirms, '*It simplifies tough topics!*' which reinforces GenAI's role in breaking down content through well-organised, accessible delivery. While most responses are positive, such as Titus calling it a '*fun and interesting way to communicate*', it is important to acknowledge differing views: some students, like Nonhlanhla felt that the avatars currently functions more as a navigator than a teacher and suggests it '*just pointed me to a section without really breaking it down*'. This balance of perspectives illustrates that while the AI-enhanced design has markedly improved EGG22's coherence and engagement, there remains room for more instructional integration.

Facilitated Discourse and Community Building

AI-generated texts were strategically deployed by lecturers to scaffold assessment preparation, which provided clear, consistent, and timely guidance that demystified difficult tasks. GenAI simulated the voice of a personal tutor and extended the lecturers' presence across time and space to ensure equitable access to support. This aligns with Garrison's (2007) conception of teaching presence as a facilitator of discourse, now re-embodied through algorithmic mediation as shown in Figure 6.

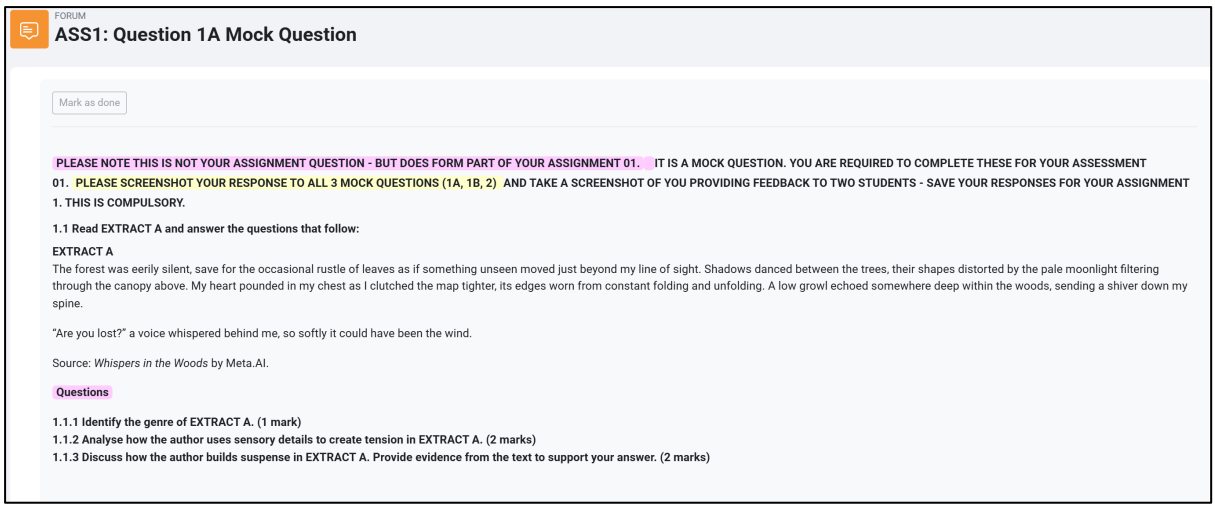


Figure 6: Lecturers' use of GenAI to create short assessment activities © The Author

It is important to note that this support was not unidirectional. In a structured peer engagement activity, students were prompted to respond to one another's contributions with constructive feedback and critique. As one participant noted, '*these activities were short and quick and helped me prepare for the assignment'*, which highlights the efficiency and relevance of the task. Figure 7 captures the outcome of this design to showcase a dynamic, participatory learning community in which the majority of over 1,000 students engaged which demonstrates a collective commitment to mutual academic development.

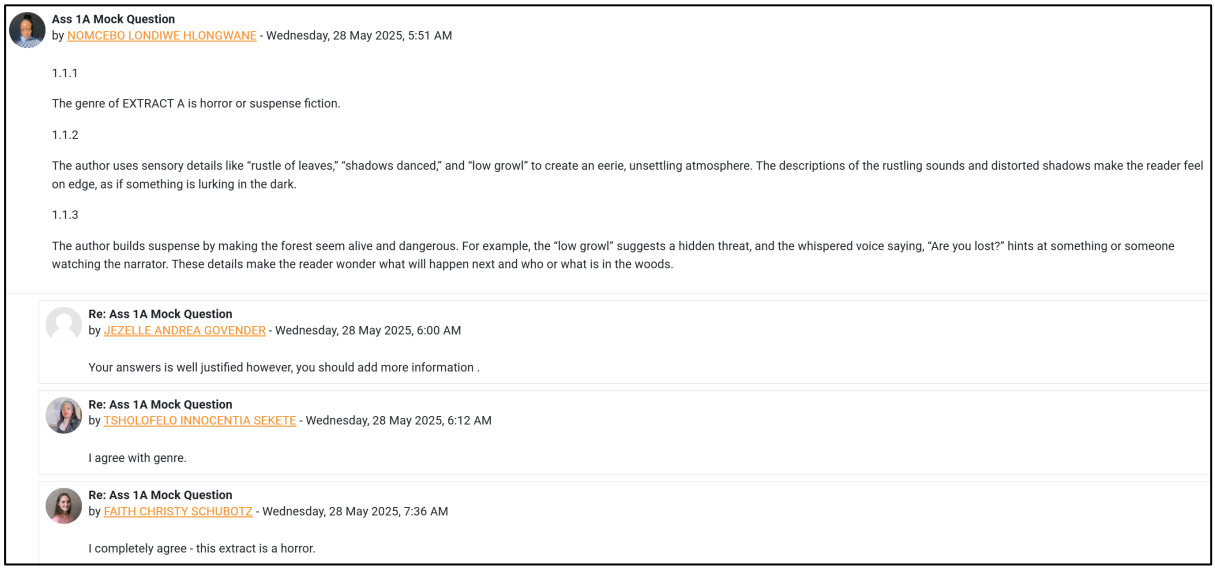


Figure 7: Student collaboration on the EGG22 site © The Author

This observation shows that collaborative learning at scale is not achieved through technology alone, but through pedagogically structured interactions that make use of AI to lower participation barriers while preserving human agency. The findings resonate with Adam et al. (2025), who argue for a 'social context favourable for learning', yet extend this principle by showing how GenAI can operationalise such a context in resource-constrained, mega-cohort contexts. GenAI resources does not seem to replace the human element but amplifies it, and creates the conditions for dialogue, reflection, and peer support to flourish. Many students embraced the peer engagement tasks: *'I learnt so much just*

from reading the responses of others'. This highlights the pedagogical potential of such activities in enabling meaningful learning and broadening perspectives. This aligns with the principles of social presence in the Community of Inquiry framework, where dialogue and shared inquiry contribute to cognitive engagement. However, this enthusiasm is counterbalanced by critical resistance, as evidenced by a student who stated, '*I would actually prefer just to do the assignments and not do these mock questions*'. This dissenting view emphasises that not all students perceive its value, particularly in high-workload, self-directed ODeL contexts. The critique points to issues of cognitive load, autonomy, and differing motivational orientations and suggests that mandatory collaboration, even when facilitated by GenAI, may not be universally effective.

Lecturers used the ChatGPT Slide Builder to transform six dense units of the study guide into concise, visually engaging PowerPoint presentations, as shown in Figure 8. These AI-generated slides included key notes, summaries, and examples, which scaffolds content for EAL students to improve comprehension.

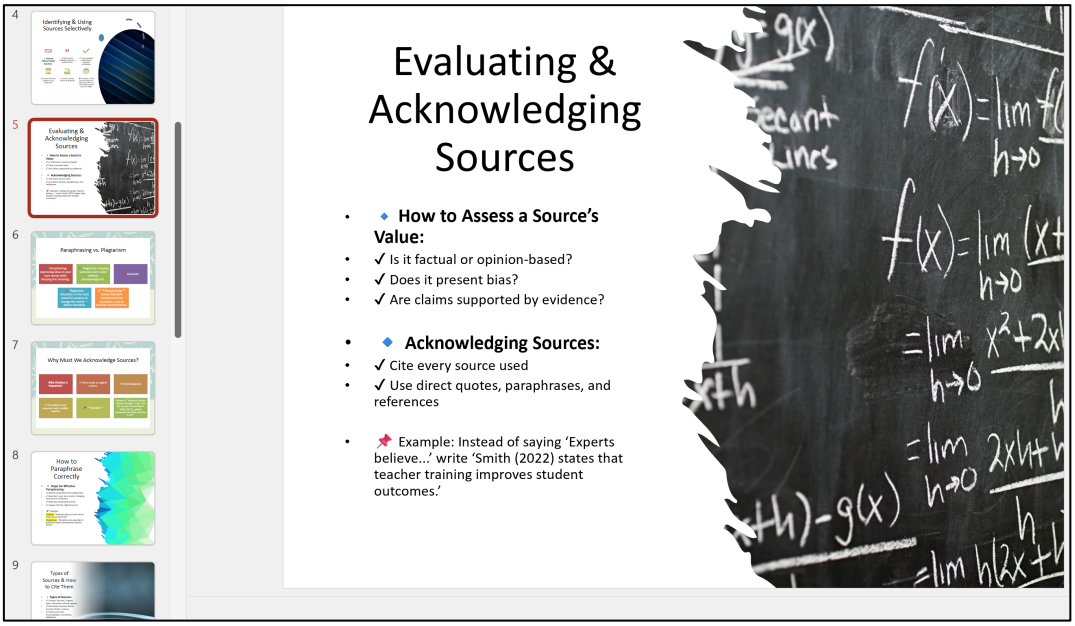


Figure 8: Using GenAI to create PowerPoint presentations

Students responded positively, and noted increased motivation and clarity, 'I feel excitement in completing one section and moving on to the next course to see the new videos prepared. These videos make me feel motivated knowing that this is exactly what I am required to know.' The structured, predictable format enhanced engagement and reduced cognitive load, which aligns with the design and organisation dimension of teaching presence (Vaughan et al., 2023).

However, a limitation emerged regarding interactivity. The videos were praised for their clarity, one student noted, '*While the videos are interactive and help with clarifying concepts, I would like to ask questions immediately, but I will have to wait to email my lecturer as feedback is not immediate*'. This highlights the inherent constraint of pre-recorded AI content: it lacks the responsiveness of live dialogue. The finding stresses the need for a blended model that combines the scalability of AI-generated materials with scheduled synchronous sessions to provide timely, personalised support and maintain cognitive momentum.

Many students expressed a strong preference for video-based learning which led to the use of the VidNoz AI app to create short, interactive videos that feature customisable avatars in terms of race, gender, and accent to enhance inclusivity (Figure 9). As one student noted, '*The videos are clear, short and insightful… [and] provide examples to enhance understanding*' (Xabiso), which reflects broad appreciation for their clarity and engagement. However, despite their effectiveness, some students noted a lack of the 'human touch', and missing the spontaneity and empathy of a real lecturer. This highlights that AI-enhanced videos are most impactful not as replacements, but as complements to human teaching that bridging accessibility and personal connection.

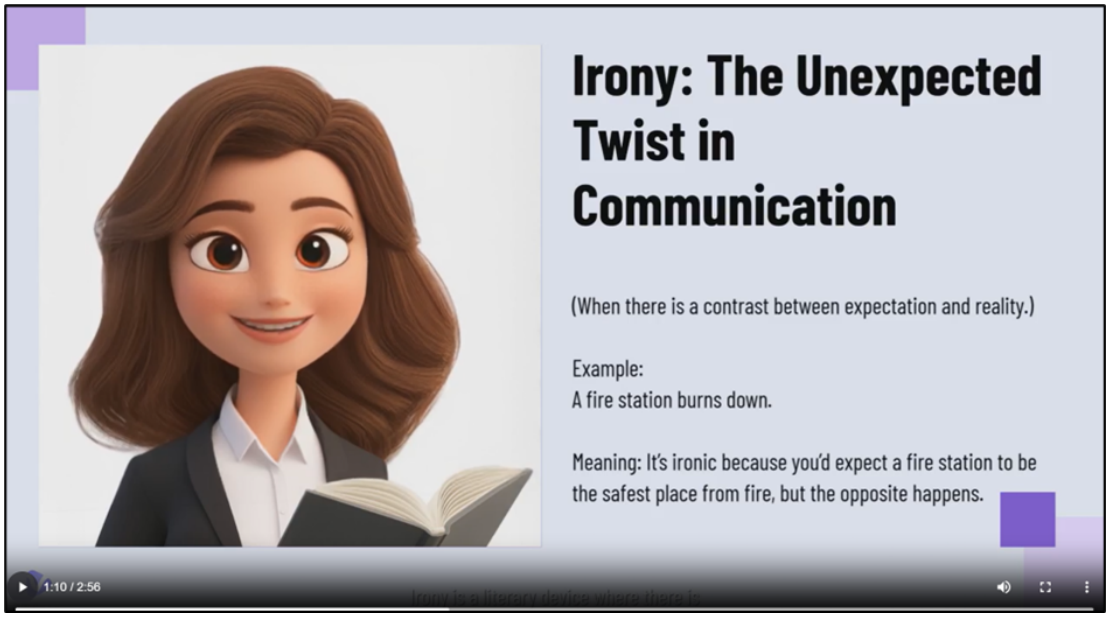


Figure 9: video co-created with GenAI © The Author

Personalised Direct Instruction and Support

Personalised direct instruction and support is realised when GenAI functions not as a substitute for the lecturer, but as a pedagogical amplifier that extends the reach of human-centred guidance. In this context, GenAI enables timely, targeted interventions by handling routine queries and content delivery that enables lecturers to free their focus on higher-order cognitive and affective support. Figure 10 illustrates a live-streamed session where lecturers model ethical GenAI use and explicitly guide students on how to employ GenAI for editing, restructuring, and ideation while upholding academic integrity. This moment of direct instruction is pertinent as it transforms abstract policies and guidelines into situated practice, which provide students with not only procedural knowledge but also moral and disciplinary grounding which can be used in their other courses.

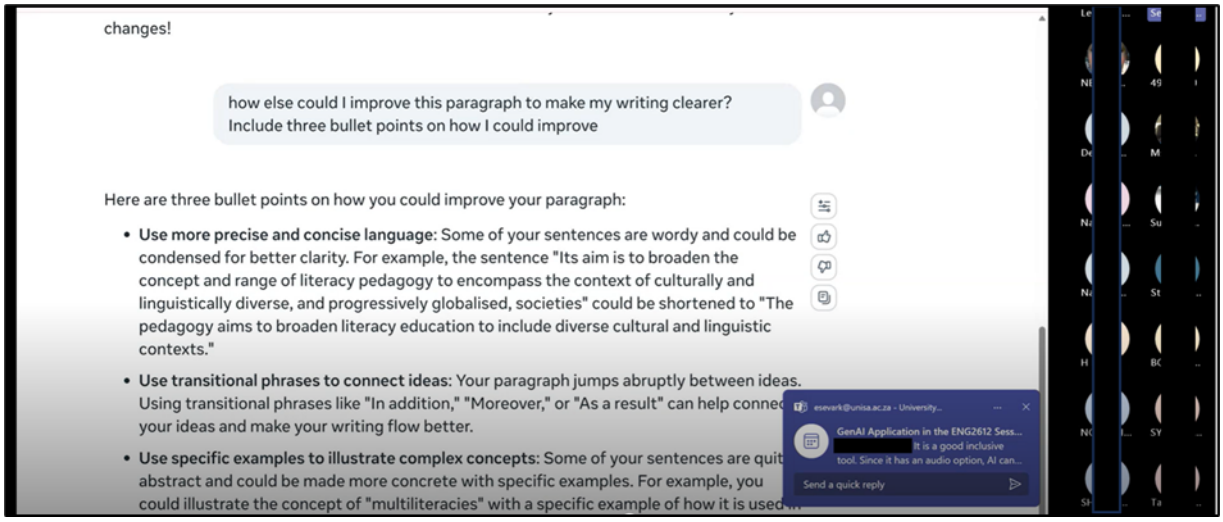


Figure 10: Lecturers teach the use of responsible and ethical GenAI use in the EGG22 course © The Author

Student feedback highlights that clear, upfront guidance on ethical GenAI use creates trust and reduces anxiety amongst students, with Nalini who notes that, '*having expectations set… removes any doubts I have*'. The non-judgmental approach was welcomed as Thabo similarly mentioned, '*I was scared of it but now I see how useful it can be*'. The mandatory AI self-disclosure statement for assessments further reinforces transparency, and demonstrates lecturer support and which promotes responsible, reflective GenAI integration.

Figure 11 illustrates an AI chatbot developed through the Contact North platform and custom-trained on EGG22's core content, which includes study guides, tutorial letters, pdf notes, assessments, and key concepts. The chatbot is hosted in a dedicated tile, it acts as an on-demand virtual tutor, and provides immediate, context-specific support that enhances accessibility and encourages independent learning. The chatbot bridges gaps in lecturer availability, particularly for EAL students in different time zones, and extends teaching presence beyond human capacity.

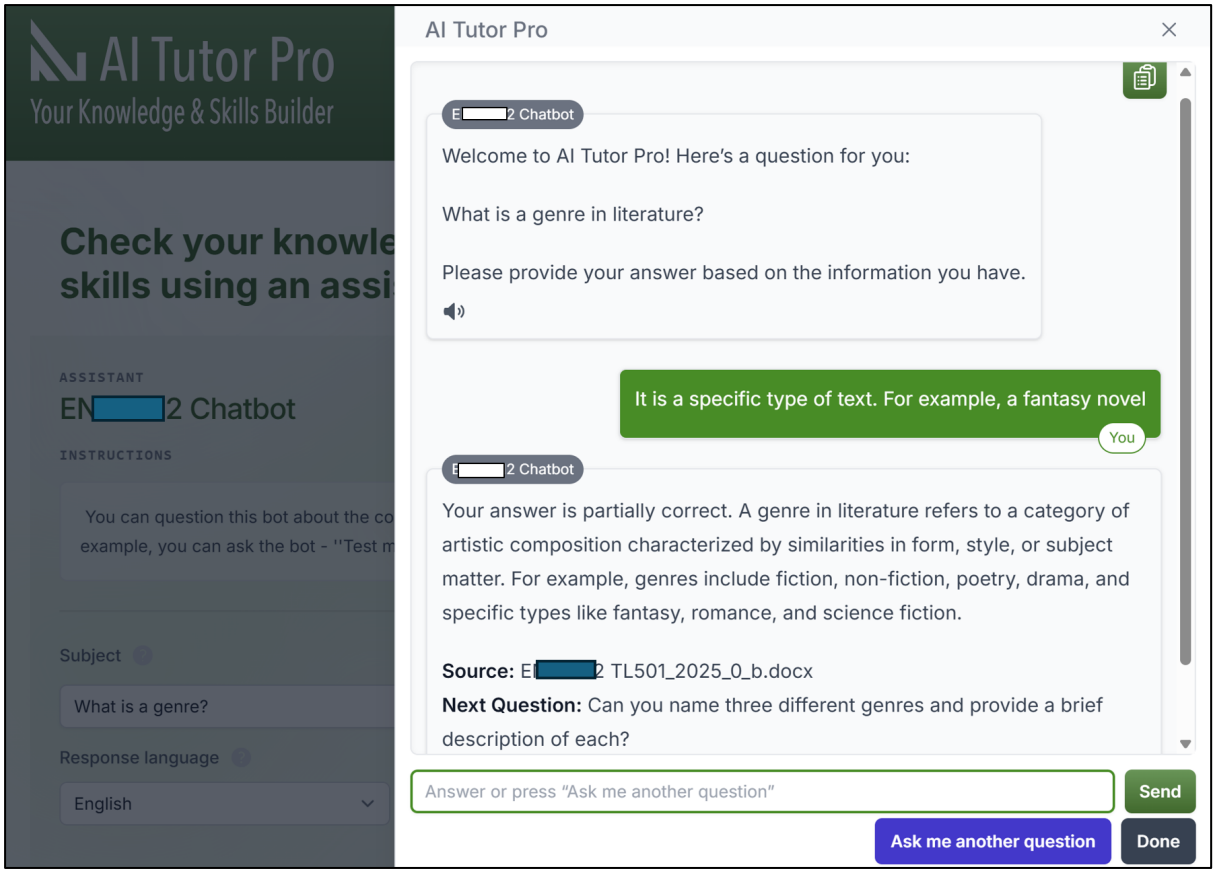


Figure 11: Chatbot customised for EGG22 © The Author

Students' responses to the AI chatbot reveal perspectives that balance appreciation for its functional benefits with a clear-eyed recognition of its pedagogical limits. On one hand, the immediacy and accessibility of the tool are strongly valued, with one student affirming, '*It absolutely did, I love the conversational feature*', and another praising its accuracy, '*The bot was highly effective to correct my errors and provide accurate answers, it's perfect!*'. The assurance of continuous support emerged as a key advantage for part-time and self-directed students, as captured in the comment, '*A big benefit is that it's always available to help, anytime*'. This corroborates with Li et al.'s (2025) findings on how AI-mediated teacher presence can enhance engagement through instant feedback. Yet this enthusiasm is tempered by students who have voiced concerns about cognitive dependency, with one warning that '*students might become reliant on this tool and not study as hard'*, which highlights a risk of undermining metacognitive development. Others noted the tool's limitations and noted that '*sometimes I still need help from a real teacher for very specific things*'. These responses reflect a sophisticated student agency, one that embraces AI as a scaffold, while insisting on the irreplaceable value of human judgment and dialogue in higher-order learning.

REFLECTION

As an action researcher embedded within the design and delivery of the EGG22 course, this study has been a reflexive journey of planning, acting, observing, and reflecting (Lewin, 1946) on the integration of GenAI into a large-scale online course within the Global South. This reflection reveals that the CoI framework, while theoretically sturdy in small-cohort online settings (Garrison et al., 2000, 2001), requires significant re-theorisation when applied to mega-enrolment contexts where human

facilitation is structurally limited. In this context, GenAI does not simply support teaching presence; it actively reconfigures it, redistributing agency across a socio-technical assemblage (Fenwick et al., 2011) composed of algorithms, pedagogical design, and human intentionality. This challenges the anthropocentric foundations of the CoI model, particularly its assumption that teaching presence is enacted solely through human action. In my role as both designer and facilitator, I have observed that AI-driven avatars, chatbots, and automated feedback systems assumed functions traditionally reserved for lecturers who create content, clarify tasks, and even simulate encouragement and thereby redistribute presence across human and non-human actors.

This redistribution became most evident during the action phase of the research, particularly in how GenAI operationalised the design and organisation dimension of teaching presence, a component often marginalised in theoretical discourse but central to scalability. In the Global South, where systemic inequities such as limited bandwidth, device access, and high student-to-lecturer ratios (2:1,300 in this case) define the educational space, GenAI emerged not as a technological luxury but as a pedagogical necessity for equity. The use of AI to generate structured videos, simplify laborious academic study guides, and deploy a 24/7 chatbot (via Contact North) was not an exercise in automation for its own sake, but a deliberate strategy to compensate for structural deficits in the learning ecosystem. However, as I moved into the reflection phase, student feedback revealed a critical dissonance; while many praised the accessibility of the GenAI resources, others expressed concerns that AI was '*giving different responses*' or felt '*static to work with*'. These observations, triangulated with my own field notes, and highlight a key limitation. GenAI, despite its scalability, lacks the hermeneutic depth and contextual responsiveness of human instruction (Ferdman, 2023; Paglieri, 2024). This prompted a second cycle of action where there was a need to revise prompts, refine avatar scripts, and introduce more explicit disclaimers about AI's limitations. The CoI framework should therefore be expanded to account for what I term algorithmic presence, a mediated form of guidance that is both enabling and constraining. If left unexamined, this presence risks creating a transactional pedagogy; when critically framed by the lecturer, however, it becomes a scaffold for meaningful engagement.

The most significant disruption, however, lies in how GenAI unsettles the very notion of facilitated discourse. The CoI framework presumes that meaningful dialogue is co-constructed through human interaction, yet the data show that AI can simulate conversations, generate a perceived social and teaching presence that lowers affective barriers. Students reported feeling less intimidated and more willing to 'bounce ideas off' the avatars and AI-generated videos, which is a sentiment echoed in their responses to prompts about engagement. This corroborates with Adam et al. (2025), but my iterative observations reveal a more concerning reality; while AI can initiate interaction, it cannot sustain dialectical tension. As Memon and Kwan (2025) note, AI-driven dialogue risks becoming a loop of confirmation rather than a space for critical challenge. The most telling understanding from the reflection phase was not the enthusiasm for AI, but the persistent invocation of the human. Students' desired for a 'real teacher' when grappling with ideas which needed further elaboration, their concern that AI creates intellectual complacency, and their insistence that it 'complements' rather than replaces. This dialectical issue became a catalyst for pedagogical redesign. In the final iteration, I introduced live-streamed sessions (Figure 10) where I modelled ethical and responsible use of AI and demonstrated not just how to use it, but how not to rely on it. This reaffirmed the lecturers' roles not as a content deliverer, but as an ethical guide and cognitive provocateur.

To answer the research question, how can teaching presence be operationalised through GenAI to encourage collaborative learning? the action research process reveals that GenAI functions most effectively not as an autonomous agent, but as a pedagogical prosthetic. It amplifies human presence by offloading routine cognitive and navigational tasks. Consequently, it frees the lecturer to focus on the relational, affective, and critical dimensions of teaching that no algorithm can replicate.

CONCLUSION, IMPLICATIONS AND RECOMMENDATIONS

This study reframes the discourse on GenAI in HEIs as it moves beyond deterministic paradigms that position AI as either a disruptive force or a mere efficiency tool. Instead, it advances a critical, contextual understanding of GenAI as a socio-pedagogical mediator that reconfigures teaching presence in large-scale online learning. The analysis reveals that GenAI does not operate in isolation but within an ecology of access, language, and institutional limitations. Its value from its capacity to amplify human intentionality and to extend the reach of the lecturer, enhance student agency, and democratise academic support in ways that are both scalable and equitable. The findings emphasise that the integration of AI and GenAI in education must be guided by a critical digital pedagogy that interrogates not only what it does, but for whom and under what conditions. In the Global South, where structural inequities influence educational participation, GenAI's most transformative potential lies in its ability to compensate for systemic deficits, not by replacing human lecturers, but by redistributing their labour toward higher-order functions such as ethical guidance, cognitive mentoring, and emotional scaffolding. The deployment of diverse and linguistically representative avatars, AI-generated study aids, and custom-trained chatbots reflects a deliberate pedagogical design to encourage epistemic belonging among EAL students and challenges the cultural hegemony often embedded in automated systems.

For ODeL institutions, the primary implication is that GenAI should be adopted not as a cost-cutting measure, but as an equity-enhancing infrastructure. A novel and non-obvious insight is that AI tools should be co-developed with students, particularly in marginalised contexts, to ensure they reflect local epistemologies and learning cultures. For example, students should customise avatar characteristics or contribute to prompt engineering to transform AI from a top-down imposition into a participatory pedagogical artefact. For lecturers, the role shifts from content delivery to algorithmic stewardship. This involves us to curate training data for AI tools, design prompts that embed disciplinary logic and critical thinking, and model ethical AI use through live demonstrations. A less obvious implication is that lecturers should be trained not only in AI literacy, but in AI pedagogy, the art of designing interactions where AI handles routine queries, where lecturers are freed of time for dialogic, reflective, and affective engagement. For course designers, the key takeaway is that GenAI integration must be pedagogically sequenced, not technologically opportunistic. Rather than embedding AI at every touchpoint, it should be strategically deployed at cognitive thresholds where its scaffolding function is most needed. Furthermore, AI-generated feedback should be transparent and traceable, where students are allowed to see the logic behind responses, which enables metacognition and digital literacy. Finally, the study calls for a reconceptualisation of academic integrity in the AI era. Rather than policing AI use, institutions should embrace AI-mediated assessment literacy, where students submit not only final products but logs of their AI interactions to enable lecturers to assess the process of learning. This transforms AI from a threat to a visible learning partner and aligns with the CoI framework's emphasis on shared inquiry.

AUTHOR'S NOTES

The author has solely conceptualised, written, and edited the article. The authors has read and agreed to the published version of the manuscript.

Ethics and Consent

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Addressing the Needs of University Students with a Mental Health Condition: Tutors' and Students' Views

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ABSTRACT

There is growing evidence that mental health conditions can have a significant negative impact on students' attainment, progression and study outcomes. Higher Education students are increasingly declaring mental health conditions to their universities and reporting issues with stress and poor mental wellbeing. Whilst research in this area has focused in the main on campus environments, issues affecting students who engage in distance learning also need to be understood. This study took an interpretivist approach with the aim to understand how tutors and students perceive and interpret mental health support in a distance learning context. Interviews were undertaken with 39 tutors, followed by three focus groups with 15 experienced tutors and a further two focus groups with a total of 9 students who had declared a mental health condition. Thematic analysis was used to analyse the transcripts. Tutors reported the needs of students to be treated as an individual alongside flexible, responsive support, whilst students agreed an individual approach was important, as well as communication from tutors and tutor availability. There is a need to take a holistic, university-wide approach, encompassing a range of factors, to provide effective support to all students to enhance their likelihood of being successful in their studies. There is also a need for further education for tutors, but time implications need addressing for tutors to provide effective support to students with a mental health condition.

Keywords

student mental health, distance learning, student support, tutor skills, maintaining boundaries.

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INTRODUCTION

The term 'mental health' as defined in the University Mental Health Charter UK initiated by Student Minds 'refers to a full spectrum of experience ranging from good mental health to mental illness' (Hughes and Spanner, 2019, p.9). In recent years, there has been an increased focus on the mental health of university students, in response to growing evidence that poor mental health can have a significant negative impact on students' attainment, progression and study outcomes (Hughes & Spanner, 2019; Office for Students 2019; Thorley, 2017; Winzer, 2018). In this paper, we align the phrase 'poor mental health' with the two definitions provided in the Office for Students UK (OfS, 2023, p. 2) 'Meeting the mental health needs of students' publication:

> (1) 'a health condition or disability reported by the student to their university or college that has a substantial impact on that student's ability to carry out day-to day activities and has lasted, or is expected to last, at least 12 months', and,
>
> (2) 'a broader range of experiences, including clinically diagnosable mental health conditions and mental distress that has not been linked to a diagnosis'.

The term used for this study is a mental health condition.

BACKGROUND LITERATURE REVIEW

Prevalence

A recent UK parliamentary report states that student mental health difficulties have increased six-fold since 2010 (Lewis and Bolton, 2023), also studies by Lewis and Stiebahl (2025) and Mason et al. (2025) suggest that the growing prevalence is a long-term problem global issue, pre-dating but amplified by the Covid-19 pandemic and cost-of-living crisis. The findings from the University Student Mental Health Survey (2020), undertaken with more than 21,000 students across 140 universities in England, Scotland and Wales, noted that more than 20% of students reported having a current mental health condition, with the most prevalent and widespread conditions being depression and anxiety disorders. Further, more than 33% of these students reported having experienced a serious mental health challenge for which they felt professional help was needed (Pereira et al., 2019). Concerns regarding rising prevalence of mental health conditions of university students have also been reported in the US (Lai & Yeung 2022) and Australia (Francis & Carter 2022) suggesting this is a problem not exclusive to UK students. Duraku et al. (2023) goes so far as to suggest that poor mental health among young people is a worldwide issue.

Fostering Disclosure

Despite the high prevalence of students with a mental health condition, a UK wide survey regarding the prevalence of student mental health conditions/poor mental health, within UK HEIs administered in 2018 (Pereira et al., 2019), found that up to 50% of students who identified as having mental health conditions/poor mental health did not declare them to their HEIs. Student surveys, where responses are confidential, have found that mental health conditions are much higher than what has been formally declared to universities. The 2022 Student Minds survey data, for example, saw 57% of respondents self-reporting a mental health issue and 27% saying that they had been diagnosed with a mental health condition (Student Minds, 2023).

Acknowledging considerable underreporting of mental health conditions by students, the UK University and Colleges Admission Service (UCAS) suggests a series of next steps with their 2021 report to be taken by the sector to achieve the aim of fostering an environment of positive disclosure which include promoting the benefits of declaration and providing reassurance that so doing will not impact on receiving an offer, so that everyone who can benefit from support is able to do so. The report, however, acknowledged that work was still needed to address knowledge misconceptions and the stigma associated with declaration.

Recognising the Impact of University on Mental Health

University students have been found to be more likely to experience or develop poor mental health than similar aged adults, suggesting studying at university is a significant influencing factor (Winzer et al.2018; Brown, 2016). However, while Higher Education can act to trigger or exacerbate mental health conditions, this link is complex as it corresponds with the recognition that most undergraduate students are at the age when they experience the developmental process of emerging adulthood when most mental health conditions develop. The combination of this major developmental adjustment along with the challenges of adapting to and coping with university life and study, combine in a detrimental way, often triggering poor mental health.

Given the data, it is unsurprising that student mental health is considered to be in 'crisis' (Hubble and Bolton, 2020) and this prior to the COVID-19 pandemic which has been recognised as having had a significantly negative effect on student mental health (Gewalt, 2022), adding a layer of chronic and unpredictable stress and creating perfect conditions for mental health crises (Hellemans et al., 2020).

From a student perspective, the following were noted as impacting negatively on students' study experience and self-esteem: the symptoms of their mental health conditions, often highly disabling and the stigma accompanying these; the lack of awareness and understanding on the part of academic staff in relation to students' poor mental health; the lack of awareness of existing support provision both within and external to their university; the need to structure and organise their own time and academic workloads, noted as particularly challenging for non-traditional students who have to juggle work and family commitments in addition to their university studies (Pedrelli et al., 2015; Storrie et al., 2010; Tinklin et al., 2005). Taken together, these points highlight the centrality of the tutor role and the implications for the support that tutors provide.

Consequences of Lack of Support

The consequences of poor mental health can be far reaching. Winzer et al. (2018) reported that poor mental health among students is associated with poorer academic achievement, worse occupational preparedness, and lower future occupational performance. This finding is supported by The Office for Students (OfS 2019) in reporting that students with mental health conditions tend to have lower rates of continuation, attainment and progression into skilled work or further study. It is therefore important that students are able to understand what support is available and access the right support early on to enable them to succeed with their studies.

Preparedness of Higher Education to Meet Students' Needs

In recognition of what is seen by some as a crisis, the OfS requires universities to make students with mental health conditions/poor mental health, a top priority and suggests they make changes throughout the whole curriculum starting with induction, as well as support services (OfS, 2019).

In recognising the need to meet this growing demand for skilled student support, Spear et al. (2021) conducted a survey across 135 UK universities reporting on the views of 130 academics. Findings were that 96% of respondents had encountered poor mental health among their students, but just 31% said their institution had adequately prepared them for working with and supporting such students. Spear et al. (2021) concluded that UK academics are ill-prepared to support student mental health. However, there is pressure on tutors to provide student support. Campbell et al. (2022) who conducted a systematic review of 31 studies exploring factors associated with mental health of university students found that developing strong, supportive social networks helped students' mental health. Gewalt et al. (2022) suggest that low-threshold initiatives are needed to mitigate poor mental health, which may include measures to reinforce students' locus of control, sense of belonging, relaxation and mindfulness as well as (online) counselling services.

The Gap in Current Research in this Area

To date little research has been undertaken exploring the role of the tutor in the success of students who declare mental health conditions. or the views of students who have declared a mental health condition to their university One piece of research that did explore the student perspective of how universities can better support students with mental health difficulties identified academic teachers and teaching practices, together with student services and support as key to student success (Baik et al., 2019).

The Aims of the Study

This study took a qualitative interpretivist approach with the aim to understand how tutors and students who have declared a mental health condition perceive and interpret mental health support in a distance learning context

METHODS

This was a qualitative interpretivist study that set out to explore the views of tutors, in relation to their support of distance learning students who had formally declared mental health conditions to the university alongside insights from students' views as to what support they felt they needed to enable them to continue with their studies. Data was collected in three stages.

Thirty-nine tutors were recruited via convenience sampling, from a range of Level one (UK Level Four) modules across a large Faculty, focusing on languages, child psychology and health and social care.

Online semi-structured interviews were carried out via Teams between January and March 2021. Each interview lasted for approximately one hour. No data bias was identified.

Three focus groups with tutors were run in January – March 2022 to verify the findings from the 39 interviews, followed by two focus groups run with nine students who had declared a mental health condition to gain their views on support they need / receive between January and March 2023.

Sample

There were three samples:

The first sample consisted of 39 tutors whose length of service ranged from six months to 27 years (mean = 16 years) were interviewed. 38 of the 39 interviewed had experience of supporting a student with a mental health condition.

The second sample consisted of 15 tutors who were recruited using snowballing sampling technique from the first sample.

The third sample included nine students who had self-declared a mental health condition to the university.

Ethical Review

The project team completed first stage ethical screening at the Open University (HREC3662Simons) and were informed by the Human Research and Ethics Committee Chair that as the study was an evaluation project, full ethical clearance was not required.

The study followed British Educational Research Associate (BERA 2018) ethical guidelines with the use of Participant Information sheets and consent forms, and confidentiality of the respondents was maintained at all times. Extra resources related to supporting students with a mental health condition were provided to tutors on completion of each interview.

Data Analysis

The data from all three samples was professionally transcribed and read and re read by hand by the project team. Thematic data analysis was used to make sense of the data, using Braun and Clarke's (2006) guide for thematic analysis: familiarising yourself with the data; generating initial codes; searching for themes; reviewing themes; defining and making themes; producing the report.

FINDINGS

The 39 interviews were conducted with tutors from three different subject areas: education (E), health and social care (H) and languages (L). Therefore, the interview codes are E, H and L.

Four themes emerged from the findings:

1. The needs of students with a mental health condition
2. Support for students with a mental health condition
3. The needs of tutors who provide support to students with a mental health condition
4. The advantages and disadvantages of studying at a distance

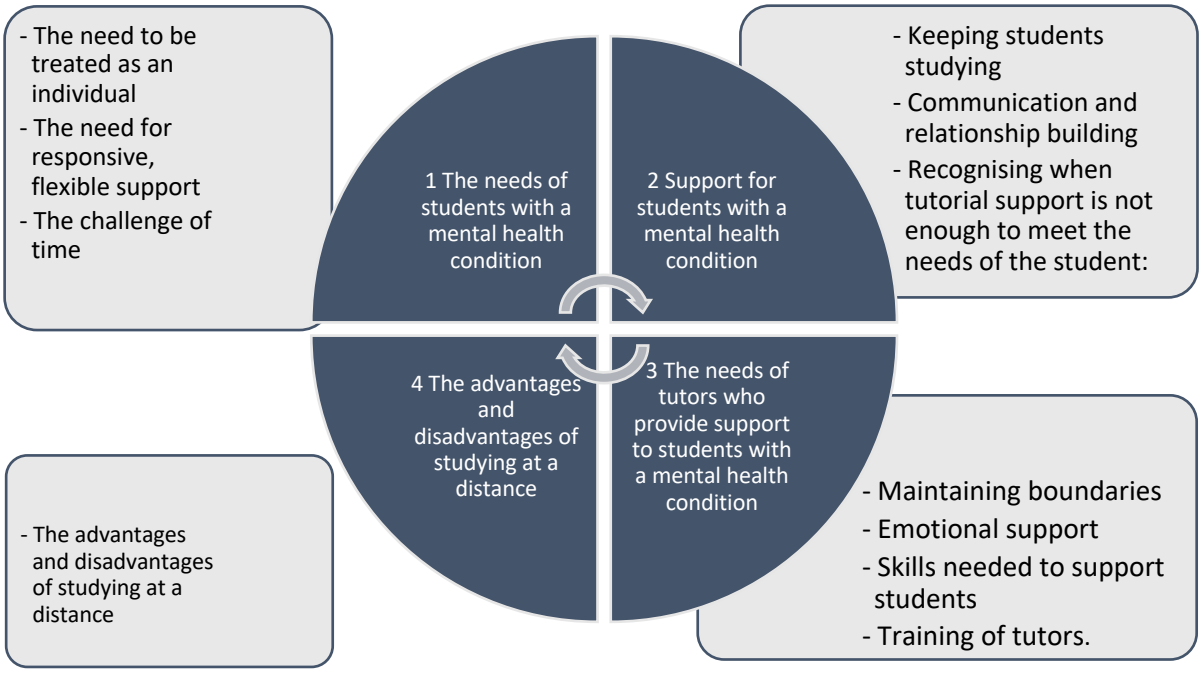


Figure 1. Four themes and sub themes ©The Authors

1. The Needs of Students with a Mental Health Condition

Within this first theme there were three sub themes:

i. The need to be treated as an individual
ii. The need for responsive, flexible support
iii. The challenge of time.

i. The Need to be Treated as an Individual

Tutors reported:

> *It's very individual: you have to keep in more contact with them, you have to be careful about the feedback you give them, they might need more tailored support and they might need individual support sessions.* (E5)

> *I think they need someone who is going to treat them like an individual because everybody's situation is different.* (E12)

Tutors explained how they take and individual approach by asking students at the beginning of a module:

> *Is there anything in your study that might affect you as the year goes on?* (E12)

> *How they feel that I can best support them in their studies - I think that is very important. Getting the student's preferred approach – individual approach*. (H25)

Many tutors said they send an additional email to students who have a disability marker on their profile, flagging their mental health condition, for example,

> *(I) send all student with a flag an additional email, establish a relationship because I think the most important thing is to listen to the student and hear what their experience is*. (H25)

ii. The Need for Responsive Flexible Support

Tutors described students' needs as:

> *It's flexibility and reassurance that seems to work.* (E1)
>
> *Flexibility, compassion, realism and the ability to be honest with the student* (E9).

Alongside flexibility students were reported as needing tutors to be approachable and available:

> *I think they need to know that they can contact their tutor and personally they can contact me any time, which I think is important.* (L28)
>
> *We need to be approachable and I think we need to be available and have understanding and compassion*. (H6)

iii. The Challenge of Time

Some Tutors commented on the disproportionate amount of time spent supporting students with a mental health condition, with support for one student sometimes outweighing support for the entire group.

> *Sometimes all too much, no way it can all be facilitated*. (H19)

Another tutor felt it was taken for granted that tutors have the skills to accommodate the needs of students with mental health conditions and that it can all be managed within their workloads:

> *They need someone who has got the time to listen to them*. (E9)
>
> *It increases the workload a bit I think, because you need to, you feel a responsibility to those students*. (H26)

Tutors commented on the impact of their mental health can mean students get behind in their studies;

> *One student contacted me in January to say she had MH problems and hadn't been able to study since October.*
>
> *I'm aware that there are study sessions and things for students to catch up if they're struggling and they're a bit behind.* (K7)

Tutors also reported the need for student to have support re time management when they fall behind in their studies:

> *It's more about let's think about how you can manage what you can do in your studying while you're going through this tricky period. So we'll outline a timetable as it were, an alternative timetable to get them to the next stage.* (E10).

2. Supporting Students with a Mental Health Condition

Three sub themes emerged from the data:

i. Keeping students studying
ii. Communication and relationship building

iii. Recognising when tutorial support is not enough to meet the needs of the student.

i. Keeping Students Studying

Tutors were mindful of the need to be reassuring, sensitive, compassionate, encouraging – but at the same time realistic, in how they provided support to students to enable them to keep studying:

> *It's important for their wellbeing to keep them going, continuation is important.* (H25)

> *Always pointing them to what to do and trying just to reassure them that it's not the end of the world, that we are here to help them*. (L37)

ii. Communication and Relationship Building

For Tutors it was important to maintain good communication channels and to be a good communicator. A summary of the responses relating to communicating with students were:

> To be accommodating, understanding, encouraging, reassuring, supportive, approachable, personable, flexible, practically helpful, intuitive, receptive, non-judgmental, sensitive, empathetic, patient and realistic; to listen and to believe/value what is being said.

Other tutors stressed the need to

> *Develop the relationship with your student so that you've got those channels of communication right from the start.* (H26)

Another tutor reported the skills needed to keep communication channels open to provide support;

> *Empathy. The ability to listen and respond. I think you need to be, yeah, quite skilful in terms of how you develop that rapport and getting the balance right between using your expertise but using it in quite a sensitive way -relationship building*. (H26)

Tutors explained approaches they take to build a relationship and provide support:

> *I send very often little encouraging emails to everyone, but in particular I'm thinking of the ones with mental health that needs to feel someone is there*. (L28)

> *Proactive support, but not making students feel different.* (H18)

iii. Recognising When Tutorial Support is Not Enough to Meet the Needs of the Student.

Tutors were aware that they needed to recognise a student's needs and respond:

> *Recognising perhaps then that you can't support as much as they need and passing it on to the student support team who will organise somebody who can*. (H23)

> *Early recognition that a student is starting to struggle. be aware of the wide resources that are available from the OU to help people, with skills section of particular things*. (H23)

Some students' expectations were described as being unmanageable at times:

> *They expect immediate response/instant gratification*. (H22)

> *And it's almost that open ended question, what are you going to do about this for me? So, I think sometimes the expectations are huge and unrealistic*. (H22)

3. The Needs of Tutors Who Provide Support to Students with a Mental Health Condition

This third theme had four sub themes:

i. Maintaining boundaries
ii. Emotional support
iii. Skills needed to support students
iv. Training of tutors.

i. Maintaining Boundaries

A common theme running through the tutor responses was boundaries, the need for tutors to be aware of their own boundaries, not to overstep their role of academic support. Tutors emphasised the need not to become emotionally involved and to make clear that the role of the tutors to support students in their learning. Some Tutors acknowledged that they had not established clear enough boundaries but pointed out that boundaries can often get blurred. Others said that they had needed to contact the Safeguarding Team following distressing messages from a student who was experiencing a crisis.

Several of the Tutors had clinical or therapeutic or social work backgrounds and stated that they were clear about boundaries and responsibilities:

> *I'm a trained psychotherapist so have a range of skills, but I ensure that it doesn't turn into a therapeutic relationship. Being a tutor is my responsibility.* (E11)

On the other hand, one tutor felt it was an advantage not to have any mental health training which she used to help maintain boundaries:

> *It's nice to be able to say I'm not trained in supporting you in this way - justifies referring on.* (E4)

ii. Emotional Support

When asked where they went for emotional support, tutors responded that they most frequently go to their line manager, followed by colleagues, family and friends, as well as external professional colleagues, Student Support Team, Tutor Forum, Togetherall (online Mental Health support service) and online sessions.

However, two interviewees said '*I have nowhere to go*'; and '*I don't know where to go'*, another said '*I carry it myself*'.

Five Tutors said that they had felt no need for emotional support; four of these respondents tutored on the first-year module that had a focus on mental health issues. The other had received specialist training on how to adopt a therapeutic stance, to not absorb difficulties or take these difficulties home.

iii. Skills Needed to Support Students

Tutors were asked a range of questions about the skills needed to provide support to students with a mental health condition as well as what training they had already had or would like to have. Tutors stated that the following skills were needed to support students with a mental health condition: *Counselling skills, coaching skills, communication skills, listening skills, interpersonal skills*.

Other suggestions made were:

> *To be attuned, intuitive, able to recognise early warning skills and to the ways students are communicating with us.* (E8)

> *Knowing your boundaries…… being, I suppose, calm as you possibly can and be non-judgemental about what they're sharing with you.* (H16)

iv. Training for Tutors

Sixteen of the 39 tutors stated that they had received training; in the main this training was at in-house tutor development events where they had attended workshops or sessions relating to supporting students with mental health difficulties. Overall, Tutors felt that the in-house training was useful in that they were able to learn from colleagues' experiences and how systems work. The training had made one tutor think more about everybody's experiences of their mental wellbeing which had led the tutor to contact students regularly.

> *There's so many resources out there for {a tutor}, but none of it is in any kind of actual onboarding training.* (E9)

Twenty threeTutors reported not having any training as an OU tutor although three had undertaken their own research, read guidelines, and downloaded OU toolkits. One respondent answered that;

> *Training possibly would blur the boundaries and make me feel that I should be more than I currently am*. (E4)

On the other hand, tutors could feel out of their depth;

> *I didn't know much at all about how to support students, I think, with mental health difficulties in terms of setting boundaries, in terms of, you know, we're not therapists...if somebody sort of phones and is in crisis I don't feel able to support them*. (L31)

Most Tutors said that they would welcome more training to be better prepared to support students with a mental health condition. Training suggestions were:

> *Anxiety, because that is something that I see students commonly reporting.* (H19)

One interviewee was very keen on a recently developed resource:

> *So there's a fantastic training, I think they call it a toolkit or something, on the OU website ….. So I did that training over Christmas and I wish I had done it before I started with the OU…… Gives links to MH support, can be copied and pasted and used for students*. (E4)

When asked if the support needed by students was beyond their role and responsibility, 22 felt that it was and had sought advice from their line managers or referred on to the Student Support Team.

> *I'm not a qualified therapist but sometimes I feel I need to be. I feel helpless quite regularly in the face of students*. (E12)

4. The Advantages and Disadvantages of Studying at a Distance

In the interviews many tutors commented spontaneously on the advantages and disadvantages of studying at a distance for students with a mental health condition.

In relation to advantages, distance learning was considered to provide an open door for students with mental health difficulties to access HE study in a way that would be incomprehensible for them to do so otherwise. Comments included the relief students with a mental health condition must feel at not having:

> *To go through the torture of face to face that they can work more at their own pace and they're under less pressure*. (E6)
>
> *That they can learn in a safer and less threatening and pressured environment, at their own pace.* (L39)

However, disadvantages of distance learning were reported in the form of creating a barrier for tutors in terms of being able to engage and develop meaningful relationships/dialogue with students with a mental health condition:

> *I think where students want to hold you at arm's length, so it's just an email conversation, is far more problematic and not particularly useful at all.* (E2)
>
> *Students disappear from our field of concern*. (L36)

Following the 39 interviews three focus groups were run with 15 tutors to further explore three issues: knowledge, skills and resources that were required by tutors to provide support for students who have a mental health condition.

The second data set was gleaned from three focus groups run with a total of 15 tutors. A summary of each focus group discussions findings is set out below.

Focus Group 1: Knowledge

Tutors demonstrated that they had considerable knowledge already but highlighted the following as areas they felt they would like to increase their knowledge to be able to:

- start conversations with students about mental health.
- end phone calls with students experiencing MH difficulties.
- respond to students in crisis on weekends
- provide the right kind of feedback
- know about one's own triggers and the effects of these.

Focus Group 2: Skills of an Effective Tutor Supporting Students with a MH Condition

In terms of the skills required by ALs to enable them to effectively support students who have declared MH difficulties or are experiencing MH difficulties, the following points were noted. Tutors wanted to be able to:

- open the lines of communication with students experiencing MH difficulties. Many comments were made about the challenges of communicating effectively with students experiencing MH difficulties, with some students declining the offer of a phone call and preferring to text instead.
- maintain a continuous communication cycle. Tutors were challenged at times when students did not respond to them.

Focus Group 3: Resources

In terms of the resources or sources of support required by tutors to enable them to effectively support students who have declared MH difficulties or are experiencing MH condition, the following points were noted:

- Needing to hear the student voice and understand what it is that students want or would find helpful.
- Having the resources in one place The AL Toolkit brings the information into one place but tutors felt challenged by having so many different links and resources
- Having a forum posting that a tutor could personalise.
- Boundaries training
- Having a printed document/flowchart

On completion of these focus groups the research team identified that the Open University Toolkit was a comprehensive resource for tutors. Also, a seminar was delivered on Boundary Setting which was recorded and made available to all tutors. The remaining issue was that tutors needed to hear the student voice to understand their needs. Therefore, the third data collection phase was two focus groups with nine students who had formally declared a mental health condition.

The third set of data from the 9 students who had declared a mental health condition, and participated in two online focus groups was analysed and three themes emerged:

- Communication,
- Being treated as an individual
- Availability of support

Communication

The preferred communication method by the majority of students was email. They felt that this gave them the time and space to consider what to say.

> *My preference is definitely email. I couldn't bear the thought of phone calls, I'd just never answer the phone, so an email is really good, it gives me time, it's just a little bit of space in there to get used to what's being said or what's being offered, so yeah, that would be my number one preference.* (S6)

However, some students found email to be easy to misconstrue and stressful to deal with.

> *So, I have a big thing where I just get a bit paranoid, where I prefer to talk on the phone because then you can hear someone's voice and it's never, there's less chance of something being misconstrued.* (S4).

Most students found phone calls ineffective and too daunting a prospect. Face to face communication was not considered by students as their tuition is online. Also receiving responses to emails in a timely manner and a clear communication of tutor working hours, was appreciated and reduced over-thinking and the build-up of anxiety on the part of students.

Keeping communication channels open, especially given that there will be periods when students, on account of their mental health conditions will be unable to engage, was considered to be very

important. Students reported that closing the communication channels could lead to them becoming paranoid.

Being Treated as an Individual

Students reported that having an individualised as opposed to a generic response from staff was considered to be good practice. They felt it facilitated the building of the tutor/student relationship:

Students expected staff to have an understanding of MHC and then to explore with them how it impacted them personally and in relation to their ability to study. Students explained to us what they wanted from their tutor in relation to being treated as an individual.

> *I want my tutor to know who I am and understand what triggers me … I want my tutor to listen. I want my tutor to see me as more of a person than just as a student*. (S1)

One student reported the impact of being treated like an individual by their tutor:

> *I liked the fact that she took the time, the tutor I've got now, took the time to get to know how it affects me and then that made a difference to me, a big difference.* (S4)

Availability of Support

Students reported that regular check-ins, especially around assessment times, were welcomed and would demonstrate that the tutor was 'there and present'. One student provided an example of a positive experience of support:

> *In my previous module, the tutor was really very supportive and she emailed me right at the start of the module to say she was aware that I'd declared this issue and she just wanted to say hello and to let me know that she was there if I needed anything. So, I was going to suggest that as an example of really good practice.* (S6)

On the other hand, tutors who complained to students of having other work/commitments which impacted on their availability, contributed to students' anxiety and often resulted in students struggling on alone rather than seek support.

In summary, the 39 tutors interviewed reported the needs of students to be treated as an individual alongside flexible, responsive support. Tutors articulated the strategies they used to provide students with support to keep them studying, such as help with managing time, but also the importance of recognising when students should take a break from studying. The needs of tutors who provide support for students who have a mental health condition were reported as ongoing training, maintaining boundaries and emotional support. Also, tutors had differing perspectives on whether studying at a distance could be an advantage or a disadvantage for students with a mental health condition. The tutor focus groups reinforced the need for knowledge, skills and resources. The nine students who participated in the focus groups articulated their needs as communication, being treated as an individual and tutors' availability.

DISCUSSION

In bringing the findings together the discussion will focus on students' needs and the impact of study on a student's mental health. This is followed by a focus on tutors' views and their needs in relation to training to be prepared to provide support to students with a mental health condition.

Students' Needs

The tutors interviewed described students' needs for study support as well as help with time management and to be treated as an individual. These findings are similar to those of McManus et al. (2020) who found that difficulties with time management and organisation of study schedules contributed to feelings of isolation and disconnection for students with a mental health condition. Doyle (2019) suggests that students with a mental health condition may experience problems maintaining concentration and attention as well as difficulty organising thoughts. Tutors in this study recognised these needs and offered additional support to enable students to keep studying.

Tutors described the needs of students with a mental health condition as being quite individual suggesting a need for individual responses to students; however, Lister et al. (2021) who identified barriers and enablers across different aspects of study, skills-development and the distance learning environment, suggested that individualistic approaches to mental health, while important, are not sufficient to facilitate student mental wellbeing. Instead, Lister et al. (2021) suggest, the adoption of a holistic approach to mental health for distance learning to enable universities to be truly conducive to student mental wellbeing. This approach supports the finding of a report by the UK mental health charity MIND (2022) which found that 57% of students surveyed reported poor mental health, whilst only 27% had a diagnosed mental health condition. Under reporting of mental health conditions by students suggests that strategies that are designed to support students with a mental health condition, such as being treated as an individual and providing individual support when needed, should be provided for all students so that students who have not declared their mental health condition can also benefit.

Impact of Study on Mental Health

McManus et al. (2020) reported students with a mental health condition found participating in classes problematic due to low mood as well as anxieties about attending events with other students and the possibility that they may be required to participate in a learning event. At the OU this is not a problem for students, and some students choose to study at a distance to avoid anxiety provoking encounters of face-to-face classes.

The tutors in this study even described some students with a mental health condition reporting studying as being positive for them, including the flexibility around when they studied as well as working in isolation. These findings are similar to those of another study by Simons et al. (2020) who interviewed 51 distance learning graduates, found that some students reported that in the midst of a life crisis their studies is what helped them to keep going.

However, there are aspects of students' lives that university colleagues have no control over that may negatively impact students. Waterhouse et al. (2020) explored work and family roles of distance learning students and found that unpaid caring responsibilities, reported work-study conflict, and family/study conflict were associated with an increased risk of reporting higher levels of mental distress. These findings fit with those of Lister et al. (2021) that both barriers and enablers to student mental wellbeing in study reside throughout learning environments and study experiences and support the contention that holistic approaches are needed to support student mental wellbeing.

The findings of this study suggest that most students would benefit from an approachable, responsive tutor who treats them as an individual, encourages them and helps to build their self-esteem and

motivation to enable them to stay on the course. This relates well to Universities UK's (UUK 2017) suggestion of a whole institution approach.

Tutors

Tutors in this study reported communication with students who had a mental health condition was a widely experienced challenge. Tutors were experienced in recognising students' needs, sometimes even when students themselves did not, and responding appropriately to their needs. Providing step by step advice for students if concentration was an issue and being mindful that feedback needed to be provided in a way students could take on board the information were strategies used. Many of the strategies they employed were examples of good practice support that any student would benefit from. The findings of a study by Duraku et al. (2023) who surveyed 234 Higher Education students suggest that with the right support universities can enhance students' academic success and personal growth, while Williams et al. (2015) who produced a report for UK HEFCE in 2015 on understanding provision for students with mental health problems and intensive support needs, reported that academic staff were seen to have a key role in supporting students with mental health problems.

However, it has been reported that distance learning students with a mental health condition engaged with tuition at lower levels than other students (Smith and Smith 2021). This low-level attendance of students is compounded by a lack of clarity for academic staff in relation to the provision of support for students with a mental health condition. Ramluggin et al. (2022) who undertook an in-depth survey with 115 academics, found that staff reported uncertainties in relation to their supporting role, which they reported to be physically and emotionally demanding. This lack of clarity is also reported on by Marais (2023) suggesting that it is a source of stress for academics and a need for tutors to be supported to set boundaries with students who have a mental health condition.

The Training of Tutors and Skills Needed

Although tutors in this study had engaged in inhouse professional development related to mental health, most reported the need for more training. Some tutors expressed concern about students' expectations of them and the view of tutors about the need to be a therapist. Hartrey et al. (2017) conducted a systematic review on the barriers and supports for students which highlighted a need for university colleagues to be educated in order to dispel myths and fears about mental illness and to enable faculty to engage with students and assist with instigation of supports when students experience mental health difficulties.

However, Hughes and Byrom (2019) who interviewed 14 academics reporting on the complex challenges in responding to students' mental health needs. While academics' lack of training indicated that concerns about a student's mental health should be referred to a specialist, it is often academic staff who students will turn to for initial and ongoing support, according to the study. This finding is supported by Spear et al. (2021) who found that academics surveyed disagreed that they had sufficient time to support students with mental health problems and said they had been supporting such students when they should have been doing other work-related activities. This supports previous studies by Huyton (2009) and Laws and Fielder (2012), who found that supporting students with a mental health condition was time-consuming and stressful for academics, exacerbated by lack of training and support for staff to develop their skills in supporting students with mental health conditions.

A university wide case study in the UK, which explored perception of support provided by staff for student mental health suggested that teaching staff needed support when supporting students with poor mental health (Payne 2022). Such training and support can be integrated into a preventative, university-wide, holistic policy for student mental health commensurate with the University Mental Health Charter (Hughes and Spanner 2019). Payne (2022) suggests that embedding such supportive practice into the curriculum is preferable to add-on services and/or interventions.

Limitations

The use of interviews as a method of data collection limits to some extent the reliability of the tutors' views as the Hawthorn effect could have meant that they only recalled what they would do on their best day rather than on an average day. The researchers were colleagues and peers of the tutors being interviewed so there may have been a reluctance to be entirely frank during the interview discussions. The 39 interviews focussed only on the first year of study, so a larger study including subsequent years would provide a richer picture of both students and tutors needs, which may change as students progress on their student journey. The students who participated in the focus groups had declared a mental health condition, however many more students who have a mental health condition do not declare it, meaning the sample could have been larger.

CONCLUSION

The approaches put forward in this study by tutors to support their students with a mental health condition such as using an individual approach and keeping communication open are practices that all students would find beneficial. Therefore, reinforcing the potential of an institution wide approach to provide necessary support to students with a mental health condition. However, in order for such an approach to be feasible and effective, the needs of university staff to have relevant training, appropriate support and sufficient time to provide the necessary support, still needs to be addressed. At the Open University we have developed a Student and Staff Mental Health and Wellbeing Strategy (open.ac.uk) (The Open University 2020) in line with the Universities UK #stepchange framework for mental health in higher education (UUK 2023) and are working to support tutors with regular in-house training to meet their needs whilst supporting students. The findings of this small study should support the contention that all students will benefit from the support identified as effective for students with a mental health condition. Such an approach is a high priority in recognition of the risk that true numbers of students with a mental health condition is likely to be double the number of students who formally declare a mental health condition to their university.

AUTHOR NOTES

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Leading through Uncertainty: The Three Cs Approach to Inclusive, Scalable and Sustainable Leadership in Higher Education

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ABSTRACT

As global landscapes continue to evolve, leaders, organisations, and individuals are increasingly confronted with challenges in navigating uncertainty. Exploring the intersections of leadership, ethics, openness, and emerging trends, this research highlights the Three Cs of Care, Curiosity, and Challenge as essential components of effective leadership in higher education amid an unpredictable world. These principles, central to the ICDE Strategic Plan for 2025-2028, are integral to developing leadership practices that foster resilience, agility and adaptability.

This research will support leaders navigating uncertainty while embodying core values of inclusivity and openness to foster transformative change. A comprehensive literature review will explore the key strengths of effective leadership and how they align with Care, Curiosity, and Challenge, demonstrating their role in fostering success in complex, rapidly changing environments.

Emphasising inclusion, sustainability, and scalability in leadership, this research aligns with the values that ICDE champions in promoting equitable access to education. Insights from the Technology and Innovation Network community will highlight how leaders worldwide are adapting to change and integrating the Three Cs into practice.

Ultimately, this research aims to provide practical guidance through a white paper and video narratives, equipping leaders, organisations and individuals to develop inclusive, scalable, and sustainable educational practices. By fostering a leadership culture based on care, curiosity, and challenge, this work addresses global, regional, and local challenges (glocalization) while ensuring effectiveness and quality in an unpredictable, fast-changing world.

Keywords

artificial intelligence; care; challenges; curiosity; higher education; leadership; scalability; sustainability; three C's approach; uncertainty

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INTRODUCTION

Higher education is being reshaped by powerful forces, technological acceleration, rising social inequities, and global volatility. In this landscape, leadership can no longer rely on traditional hierarchical models. Instead, institutions require approaches that are not only adaptive and ethically grounded, but also sustainable, scalable, and glocalised, responsive to both global imperatives and local contexts. The integration of generative artificial intelligence (AI) has accelerated these demands, raising urgent questions around inclusion, innovation, and institutional purpose.

This paper responds to that challenge by proposing a values-based model for leadership in higher education, guided by the Three Cs, Care, Curiosity, and Challenge, as articulated in the ICDE Strategic Plan 2025–2028. Drawing on findings from a global survey of higher education leaders, the study reveals how these three interdependent principles offer a coherent, human-centred framework for navigating uncertainty and transformation. Leaders are demonstrating Care through empathy, equity, and ethical stewardship, Curiosity through innovation, AI fluency, and cultural responsiveness, and Challenge through courageous, forward-thinking decisions that question outdated norms and foster systemic change.

Importantly, this study positions the Three Cs not as abstract ideals, but as strategic imperatives for cultivating leadership that is scalable across institutions, sustainable over time, and glocalised in its ability to balance local relevance with global responsibility. By aligning leadership with these principles, the sector can better realise its potential as a site of social justice, digital innovation, and collective resilience. This research is part of the ICDE Technology and Innovation Network (TIN) Goal ONE: Leading through Uncertainty.

LITERATURE

Higher education institutions (HEIs) are undergoing profound transformation, driven by digital acceleration, the integration of artificial intelligence (AI), and an increasingly volatile global landscape. As Campbell et al. (2023) argue, educational leaders are being asked to navigate a layered set of uncertainties, including constitutional instability, forced migration, and the challenges of operating in a post-truth era. In such a context, traditional leadership models no longer suffice. Instead, there is a growing call for adaptive, human-centred leadership grounded in strategic foresight, emotional intelligence, and systemic resilience. Ellis (2024) reinforces this view, advocating for a shift from hierarchical structures to a dynamic, ecosystemic model of leadership that is capable of responding to rapid and often unpredictable change.

Building on these perspectives, Fick-Cooper (2025) provides a tangible framework, the Direction, Alignment, Commitment (DAC) model, which offers a pragmatic approach to navigating ambiguity. By

focusing on clarity of purpose, collaborative alignment, and shared accountability, the DAC model resonates strongly with the principles of Care, Curiosity, and Challenge. It emphasises the importance of not only setting direction but also cultivating trust and cohesion within teams, key components of a resilient and inclusive leadership culture. Gering et al. (2025) similarly underscore this shift, noting that many leading universities are now embedding interdisciplinary collaboration, innovation, and inclusivity into their strategic plans. Taken together, these insights suggest that leadership in higher education must evolve, not just structurally, but philosophically. We argue that the Three Cs offer a timely and values-driven framework that helps leaders meet this challenge with clarity, compassion, and courage.

The value of Care emerges consistently across the literature as a foundational trait of effective leadership in times of uncertainty. Far from being a peripheral concept, care is increasingly recognised as a strategic necessity, encompassing emotional labour, empathy, wellbeing, and ethical stewardship. Beresford-Dey et al. (2024) build on Complexity Leadership Theory to propose compassionate leadership as a critical enabler of institutional resilience, particularly in high-pressure environments. Similarly, Le Thanh Thao et al. (2023) identify empathy, support, and transparent communication as defining features of transformational leadership—attributes that align directly with the principles of Care and are essential in building trust during disruptive change.

These qualities take on added urgency in today's digital education landscape. The widespread adoption of AI and other digital technologies has contributed to increasing levels of technostress among educators, with staff experiencing high expectations for constant availability and adaptability (Handayani, 2023; Rademaker et al., 2023). As Ross et al. (2024) and Yin et al. (2024) observe, supportive leadership that acknowledges these pressures and responds with empathy can play a decisive role in promoting staff wellbeing and institutional trust.

Importantly, Care must also be understood through the lens of inclusivity. As Harris et al. (2024) argue, truly inclusive leadership ensures that AI integration is not only technologically sound but also ethically grounded, guided by principles of equity, cultural responsiveness, and data privacy. These imperatives are not optional add-ons; they are core components of sustainable digital transformation. The UNESCO (2024) AI Competency Framework reinforces this view, outlining essential teacher capabilities that protect human agency and professional autonomy within increasingly automated educational environments. Similarly, Miao and Holmes (2023) emphasise the need for national-level policy frameworks that guarantee equitable access to AI-enhanced learning, particularly for learners in marginalised or underserved communities at risk of exclusion from the digital future.

This intersection of care and inclusion is where we believe institutional leadership must be most deliberate. Care is not merely a soft or reactive stance to institutional pressures, it is a proactive, strategic orientation. When embedded as a core value in leadership practices, care helps foster psychological safety, ethical decision-making, and inclusive environments that value all stakeholders. In our view, leading with care enables higher education institutions to remain fundamentally human-centred, even as they undergo profound technological transformation. Within the Three Cs framework, care serves as a stabilising force, one that anchors ethical leadership amid uncertainty and complexity.

Building on this perspective, Campbell et al. (2023) stress the importance of institutionalising care through tangible support structures. This includes professional development initiatives that explicitly cultivate emotional and social competence in leaders at all levels. Without this kind of systemic reinforcement, care risks becoming a rhetorical device rather than a lived practice. We argue that

investing in these structures is essential if institutions are to move beyond performative inclusivity and truly embed care in the everyday fabric of leadership. When done well, such efforts cultivate cultures of belonging, mutual respect, and shared responsibility, foundations that are vital to sustaining higher education through periods of uncertainty. To complement this foundation of care, effective leadership must also be driven by Curiosity, a forward-looking orientation that embraces innovation, seeks out new possibilities, and remains open to the evolving questions that shape education in a postdigital age.

To complement this foundation of care, effective leadership must also be driven by Curiosity—a forward-looking orientation that embraces innovation, seeks out new possibilities, and remains open to the evolving questions that shape education in a postdigital age. In times of rapid technological and social transformation, curiosity is not a luxury but a leadership imperative. It signals a willingness to experiment, to learn, and to challenge conventional thinking. In the context of higher education, where the pace of change is accelerating, cultivating curiosity enables leaders to anticipate future demands rather than react to them.

Curiosity in leadership is characterised by openness to innovation, responsiveness to emerging trends, and a deep commitment to lifelong learning. In the evolving landscape of AI and digital transformation, Bevilacqua et al. (2025) highlight the growing need for leaders to develop AI fluency and data literacy, not simply to adopt technologies, but to understand their implications for teaching, learning, and institutional strategy. Crucially, this involves more than technical proficiency, it requires the capacity to ask meaningful questions, navigate ethical dilemmas, and engage collaboratively in solving complex problems.

Ellis (2024) reinforces this by advocating for an ecosystemic leadership model, one that weaves curiosity throughout institutional governance, policy development, curriculum reform, and technological infrastructure. Such a model supports leaders in cultivating a learning mindset, which is essential for organisational agility and strategic responsiveness. It aligns with the vision set forth by the World Economic Forum (2024), which identifies curiosity and critical thinking as indispensable competencies in the age of Education, where knowledge is no longer simply transmitted but co-created with the support of AI tools.

This shift is echoed in UNESCO's (2023) call for a humanistic approach to AI, where curiosity plays a central role in shaping ethical, inclusive, and digitally literate educators. Here, curiosity is not simply about discovery, it is about discernment. It enables educators and leaders to explore AI's potential while critically evaluating its risks. Gering et al. (2025) illustrate this in their analysis of leading universities, where curiosity is shown to fuel adaptive strategy-building. For example, teaching and learning units often act as dynamic bridges between institutional strategy and grassroots innovation, translating curiosity into practical and scalable change.

Yreck (2024) further situates curiosity as a cultural disposition, an embedded norm that supports adaptive management and iterative sensemaking. In this framing, curiosity is both personal and collective, driving individual exploration while fostering institutional cultures that reward experimentation, dialogue, and reflection. We believe this is vital for higher education leaders navigating today's uncertainty. Without curiosity, institutions risk becoming stagnant in a time that demands adaptability. With it, they are equipped to evolve, engage, and inspire.

In our view, curiosity must be positioned as more than an individual trait, it should be cultivated systemically. Leaders must model intellectual openness, create space for inquiry and risk-taking, and invest in professional learning environments that reward questioning over compliance. As part of the Three Cs, Curiosity invites institutions to see change not as a threat, but as an opportunity to learn, grow, and lead with purpose. Yet, while Care grounds leadership in values and Curiosity drives innovation, it is Challenge that propels leaders to take courageous action, questioning the status quo, navigating complexity, and making strategic decisions in the face of uncertainty.

Challenge is an essential dimension of leadership in times of uncertainty, demanding courage, critical reflection, and a readiness to confront complexity head-on. It requires leaders to question established norms, navigate uncomfortable realities, and make principled decisions amidst ambiguity. In the rapidly evolving landscape of higher education, particularly as generative AI reshapes learning, teaching, and institutional operations, Challenge is what compels leaders to move beyond passive adaptation toward purposeful transformation. It is the force that pushes institutions to not only respond to change, but to shape it ethically and strategically.

Quaquebeke and Gerpott (2024) introduced the NOW–NEW–NEXT model, urging leaders to anticipate AI's expanding role in decision-making and to develop the capacity to 'lead the AI that leads the humans.' This framing signals a shift in how leadership must be conceptualised, no longer confined to human-to-human hierarchies, but extended to include ethical oversight of machine intelligence. Such leadership demands not only technical fluency, but a deep rethinking of responsibility, agency, and institutional purpose.

Khairullah et al. (2025) echo this call for responsible strategic leadership, emphasising the need for ethical governance, bias mitigation, and sustained capacity-building in AI integration. UNESCO (2023) further reinforces this by advocating for a human-centred, risk-conscious approach to generative AI, one that upholds data privacy, promotes algorithmic transparency, and prioritises equity. In this context, Challenge also means having the resolve to put ethical considerations before expediency, and to make bold decisions even when they carry reputational or political risk.

Institutional transformation, however, does not occur in a vacuum. Tarisayi (2024) and Anjali & Sreerekha, (2024) champion distributed leadership, emphasising the importance of inclusive governance and shared policy development to effectively address the demands of uncertainty. Yet, as Onan (2024) notes, such transformation often encounters entrenched resistance, stemming from outdated infrastructure, limited digital skills, or cultural reluctance to change. Here, Challenge becomes a collective endeavour, a willingness to confront internal barriers, facilitate dialogue, and reimagine institutional cultures from within.

Educators must be equipped with AI-related competencies that include ethical judgement and critical digital literacy, skills that are foundational for navigating emerging technologies responsibly. This expectation, outlined in recent guidance on AI integration in education (Miao & Holmes, 2023), highlights a broader imperative for institutional leaders. From our perspective, this underscores a core leadership responsibility, to create the conditions where ethical risk-taking is supported, inquiry is encouraged, and professional growth is prioritised. Within the Three Cs framework, Challenge is about confronting uncertainty, not through reactive change, but through deliberate, values-driven leadership. Ultimately, leading through challenge means embracing the discomfort of change while holding firm to principles of justice, inclusion, and accountability. When balanced with Care and

Curiosity, Challenge empowers higher education leaders to move beyond performative responses to uncertainty and to cultivate cultures capable of transformative, future-ready leadership.

The Three Cs are not discrete or isolated traits, but deeply interconnected domains of effective leadership practice. When taken together, they provide a cohesive framework for navigating the multifaceted demands of contemporary higher education. The ecosystemic model proposed by Ellis (2024) illustrates this convergence, demonstrating how Care (equity, ethics), Curiosity (innovation, responsiveness), and Challenge (strategic risk-taking) intersect to cultivate a resilient and future-focused leadership culture. Similarly, Butler and Yendol-Hoppey (2024) show how leadership capacity can be developed through reciprocal mentoring and critical friendship, approaches that reinforce both care and curiosity by fostering relational trust, reflective dialogue, and shared growth.

We see these interdependencies reflected not only in leadership theory but also in global policy directions. UNESCO's normative and policy frameworks (Miao & Holmes, 2023) exemplify how Care, Curiosity, and Challenge can be operationalised at scale, grounding educational practice in ethics, advancing digital competencies, and encouraging agile responses to emergent challenges. In our view, these frameworks are more than aspirational, they offer actionable guidance for educational leaders navigating complex transformations, especially those driven by AI. The imperative is clear, effective leadership today must simultaneously nurture human relationships, explore new pedagogical frontiers, and make difficult, often high-stakes decisions about institutional strategy.

What is often underemphasised, however, is the emotional and relational toll of balancing these leadership demands. Beresford-Dey et al. (2024) and Ross et al. (2024) remind us that managing the interplay between Care, Curiosity, and Challenge requires more than cognitive agility, it demands emotional intelligence, self-awareness, and sustained interpersonal effort. Leaders must be supported not only in driving change but in sustaining their own wellbeing as they support others. From our perspective, this highlights a key tension in modern leadership, the expectation to be simultaneously visionary and grounded, adaptive and consistent, emotionally present and strategically detached. A leadership model rooted in the Three Cs acknowledges this complexity and offers a holistic, human-centred response.

In bringing together the literature explored throughout this paper, a compelling picture emerges of the complex terrain higher education leaders must navigate in a post digital era. As institutions grapple with the integration of generative AI (GAI), they are not merely responding to technological trends, they are being called to re-evaluate the very essence of what it means to lead, teach, and learn in contemporary higher education (Fawn, 2024). This transition is not only operational but deeply philosophical. Leaders must now engage with critical questions that go beyond tools and platforms to challenge the foundational values, pedagogical assumptions, and ethical commitments that underpin academic institutions.

From the authors' perspective, this is not a moment for incremental change, it is a moment for reflective and strategic transformation. As GAI becomes embedded in curriculum design, assessment practices, and institutional workflows, the role of the leader becomes one of orchestrating coherence amid uncertainty. Leadership must shift from merely managing digital systems to actively shaping the moral and intellectual direction of AI-enhanced education. This requires more than policy compliance or technical expertise, it demands values-driven decision-making that aligns with the long-term mission of higher education.

While Ellis (2024) and others frame these post digital leadership pressures in structural terms as governance, strategic alignment, and digital infrastructure, there is growing recognition that such structural adaptation alone is insufficient. We argue that truly effective leadership during periods of uncertainty requires something deeper, the capacity to lead with ethical sensitivity, contextual agility, and emotional resilience (Fick-Cooper, 2025; Miao & Holmes, 2023). These capabilities align seamlessly with the Three Cs approach. Care provides the moral grounding to navigate difficult decisions with empathy and integrity; Curiosity encourages leaders to remain open to possibility and pursue knowledge beyond established boundaries; and Challenge supports courageous, values-driven action in the face of complexity.

The rise of AI is not only reshaping what leaders do but redefining how leadership is conceptualised, distributed, and sustained. Scholars such as Ellis (2024) and Tarisayi (2024) advocate for a shift away from top-down, hierarchical models towards more participative and distributed forms of leadership. In this emerging paradigm, leadership becomes a shared process of sensemaking, where staff, students, and academic leaders co-construct meaning and solutions in a constantly shifting environment (Longmuir et al., 2023). We see this as not only a response to uncertainty, but a deliberate strategy to build institutional resilience and foster inclusion.

This collective, relational model of leadership is further reinforced by approaches such as reciprocal mentoring and 'critical friendship' (Butler & Yendol-Hoppey, 2024), which create psychologically safe spaces for reflective dialogue, mutual support, and innovation. These practices are deeply connected to Care and Curiosity, enabling leaders and their teams to navigate new pedagogical paradigms with both confidence and humility. As AI technologies continue to reshape the teaching and learning landscape, such practices may be especially critical in supporting early and mid-career academics adapting to new professional identities (Shal et al., 2024).

Moreover, leadership development in this context cannot be divorced from the cultivation of emotional intelligence. As Beresford-Dey et al. (2024) contend, compassion must be understood not as a soft skill but as a strategic asset, central to building trust, supporting well-being, and guiding institutions through uncertainty. This aligns with Fick-Cooper's (2025) DAC framework, where Direction, Alignment, and Commitment are achievable only when leaders foster shared purpose and emotional connection within their communities.

From a global policy perspective, initiatives such as UNESCO's AI Competency Framework for Teachers (Miao & Holmes, 2023) offer a clear pathway for embedding ethical, human-centred approaches to AI in education. These frameworks highlight the need for leadership that balances Challenge with Care and Curiosity, especially in addressing global disparities in digital readiness. The World Bank's regional analysis (Ezequiel et al., 2025) reinforces this, identifying significant gaps in infrastructure and training between higher education systems in the Global North and South. For leadership to be genuinely inclusive and sustainable, these asymmetries must be acknowledged and addressed.

Artificial intelligence (AI) is also increasingly being positioned within global education agendas as a key enabler of strategic transformation. Notably, UNESCO (2021) envisions AI as a critical tool in accelerating progress toward the achievement of Sustainable Development Goal 4 (SDG 4): ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all. This vision challenges higher education institutions to consider how AI can be harnessed not only for institutional efficiency or innovation, but to advance global equity and social justice. From our

perspective, this global framing reinforces the urgency of adopting leadership approaches, such as the Three Cs, that foreground ethical responsibility, inclusive practice, and long-term societal impact.

Crucially, leadership in the age of GAI cannot be confined to managing digital systems, it must extend to shaping institutional values and culture. Leaders are now called upon to interrogate the broader ethical implications of algorithmic bias, surveillance, and shifts in human agency. As Quaquebeke and Gerpott (2024) suggest, the task ahead is to 'lead the AI that leads the humans', a challenge that calls for a re-examination of every facet of educational vision, design, and delivery. We believe this requires not only technical competence but ethical conviction and strategic boldness.

Despite the increasing attention AI receives in university strategies, many institutional planning documents still lack depth in outlining how these technologies will be implemented meaningfully and responsibly (Gering et al., 2025). This underscores a pressing need for practice-based research that captures the lived realities of implementation, particularly how institutions can uphold academic freedom, inclusivity, and student agency while engaging in digital transformation.

A consistent thread across the literature is the growing need for leadership in higher education to draw from multiple domains, ethics, technology, pedagogy, and organisational theory, reflecting the complexity of the post digital environment. Effective leadership in this context is inherently interdisciplinary, requiring a blend of competencies that cannot be developed in isolation. This aligns closely with the integrated nature of the Three Cs. Rather than viewing Care, Curiosity, and Challenge as distinct traits, we understand them as mutually reinforcing elements of a holistic leadership practice. For example, when responding to an AI-related data breach, effective leadership involves more than technical troubleshooting. It requires Challenge in making timely, strategic decisions, Care in how the response is communicated and support is provided to those affected, and Curiosity in critically examining the failure, learning from it, and strengthening systems to prevent future occurrences. This interplay illustrates how the Three Cs can inform practice in tangible, actionable ways, supporting leadership that is responsive, ethical, and future-focused. To embed these values meaningfully, we argue that institutions must invest in system-level design that supports iterative learning and adaptive leadership. This includes embedding feedback loops, enabling professional learning communities, and rewarding innovation without fuelling burnout. As Ellis (2024) describes, these ecosystemic structures are essential to ensuring the Three Cs are not just aspirational rhetoric but embedded in the daily practice of inclusive and sustainable leadership.

METHOD

This study employed a survey methodology to explore how higher education leaders are responding to uncertainty and complexity in contemporary educational contexts. The survey was developed as part of the ICDE Technology-Enabled Innovation Network (TIN) Goal 1 initiative, Leading Through Uncertainty, and aligned with the ICDE Strategic Plan 2025–2028. The survey included both closed and open-ended questions designed to capture respondents' perspectives on effective leadership qualities, institutional priorities, and perceived opportunities and challenges. It was distributed internationally via professional networks and ICDE affiliated platforms, targeting individuals in academic leadership and governance roles.

Research Design

This study employed a qualitative descriptive research design situated within an interpretive framework. It aimed to explore how higher education leaders conceptualise and enact leadership in times of uncertainty. Drawing on the ICDE's Three Cs framework, Care, Curiosity, and Challenge, the research sought to examine leadership priorities, values, and practices as expressed through survey responses.

While the survey included some closed-ended questions to gather contextual demographic data, the primary focus was on the rich, open-text responses. These were thematically analysed to identify recurring patterns and insights related to leadership during uncertainty. The interpretive lens allowed for a deeper understanding of how leaders navigate evolving educational environments and positioned participant perspectives within broader discourses on educational change and leadership theory.

Data Collection

Data were collected via an online survey distributed through the ICDE Technology-Enabled Innovation Network (TIN) as part of its Goal 1 project, Leading Through Uncertainty. The survey was open for responses over a four-week period and targeted individuals in leadership or educational development roles in higher education globally. It included a combination of closed-ended and open-ended questions designed to explore leadership priorities, values, and perceptions in response to emerging challenges, particularly those related to digital transformation, equity, and institutional change. The survey was administered using a secure online platform, and participation was voluntary and anonymous.

Sampling or Research Group

This study used a cross-sectional online survey targeting members of the ICDE Technology, Innovation and Network (TIN), focusing on leadership, and AI in higher education contexts. A total of 33 responses from 23 countries (See Figure 1) were collected through open invitation to TIN members, representing a purposive and globally diverse sample of educational leaders, policymakers, and practitioners.

Closed-ended survey responses were summarised using descriptive statistics. Open-ended responses were analysed thematically using Braun and Clarke's (2021) reflexive thematic analysis approach. This involved six recursive phases: familiarisation with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the final report. To support the early stages of familiarisation and pattern recognition, NotebookLM, a generative AI-powered note organisation tool, was used to assist in organising and clustering open-text responses. While this tool facilitated the identification of potential thematic patterns, all final codes and themes were developed and verified through manual, interpretive analysis to ensure rigour, researcher reflexivity, and alignment with the Braun and Clarke framework.

Themes identified through this process were then interpreted within the Three Cs leadership framework, Care, Curiosity, and Challenge, and considered alongside current literature on leadership in higher education.

Ethical integrity and trustworthiness were supported through reflexive practice, the maintenance of analytic memos, peer discussions, and the alignment of theme development with clear audit trails.

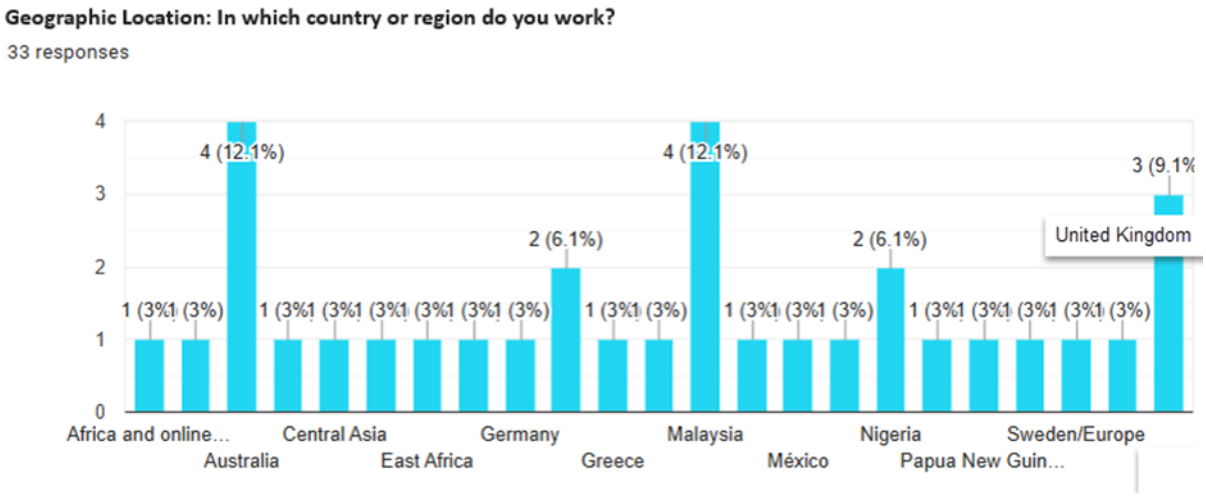


Figure 1. Geographic Distribution of Respondents © The Authors

Research Procedures

A preliminary literature review was conducted to establish a conceptual foundation for the study. Subsequently, an online survey titled 'Leading Through Uncertainty: The Three Cs Approach to Inclusive, Scalable, and Sustainable Leadership in Education' was distributed through ICDE communication channels, with official endorsement from the ICDE Secretariat. The survey remained open for four weeks. Data were anonymised and analysed using descriptive statistics and thematic analysis. Emergent themes informed the development of a forthcoming white paper and a set of video narratives, which will be presented at the 30th ICDE World Conference in Wellington, New Zealand, in November 2025.

Validity and Reliability Measures

To enhance content validity, the survey instrument was reviewed by leadership scholars and ICDE project leads to ensure alignment with the research aims and the Three Cs framework. Reliability was supported through consistent dissemination procedures and purposive sampling of a defined professional community (ICDE TIN), whose members possessed contextual familiarity with the themes under investigation. Anonymised responses were analysed systematically to ensure consistency in coding and interpretation.

Ethical Considerations

The project is formally aligned with ICDE TIN Goal ONE and has received approval from the ICDE Secretariat for data collection and dissemination. Participation was voluntary, with informed consent obtained at the beginning of the survey. No personally identifiable information was collected, ensuring confidentiality and data protection in accordance with ethical research standards.

PRELIMINARY FINDINGS AND DISCUSSION

Leadership Roles and Survey Overview

The survey gathered insights from 33 respondents from 23 countries, providing a diverse and globally informed perspective on educational leadership. Participants represented a range of roles, with the majority having three to five years of leadership experience. Notably, 36.4% (see Figure 2) served as

program coordinators or course leaders, while others held more senior positions such as deans, directors, or executive leads. This diversity of leadership experience and geographic representation contributed to a rich and nuanced dataset, capturing both institutional and cultural variations in how leaders navigate complexity. The breadth of responses offered valuable insights into the lived realities of leading through uncertainty, insights that informed the thematic analysis presented in the following sections.



Figure 2. Leadership experience © The Authors

The analysis of the survey responses revealed five interconnected themes that collectively offer a nuanced portrait of how educational leaders are navigating uncertainty in the current global landscape. First, **AI Transformation and Digital Opportunity** highlighted the ways in which artificial intelligence is reshaping teaching, assessment, and institutional strategy, bringing both potential and complexity. Second, **The Importance of a People-Centered and Value-Driven Leadership Culture** emphasised empathy, inclusion, and integrity as essential to effective and ethical leadership. Third, **Proactive Shaping of Change** showcased the strategic foresight and lifelong learning needed to lead with curiosity and intention, rather than reactively. Fourth, Challenges Beyond Technology drew attention to structural and cultural barriers such as funding instability, policy fragmentation, and organisational resistance. Finally, **The Power of Collaboration and Shared Leadership** underscored the significance of empowering teams, building trust, and fostering glocalised partnerships to enable scalable and sustainable change.

AI Transformation and Digital Opportunity: Navigating Innovation, Equity, and Uncertainty

Leaders across the sector acknowledge that AI has moved from experimental to mainstream, dramatically reshaping educational practice. As one respondent noted, *'Since 2023, the education landscape has evolved dramatically with AI integration moving from experimental to mainstream, reshaping teaching methods and assessment.'* Respondents highlighted leadership opportunities to expand access, promote inclusion, and personalise learning through AI. One remarked, *'The biggest*

opportunities lie in leveraging technology to expand access, personalize learning, and reduce inequality.' Others emphasised the potential of open resources: *'Open educational resources (OER) can democratise high-quality content globally, reducing costs and enabling lifelong learning.'*

Leaders are also seen as key drivers of institutional readiness. As one respondent stated, *'Preparing themselves and their faculty and the entire institution on AI, emerging technologies, and new pedagogies...'* Yet this leadership role also brings significant challenges. Several respondents warned of lagging policies, resistance to change, and ethical tensions. *'The biggest challenges include digital inequality, limited infrastructure, and resistance to change,'* and *'Leaders must balance innovation with safeguarding learner privacy, well-being, and cultural relevance.'*

Respondents further criticised the influence of external narratives and commercial agendas. R16 described 'the hype machine of the tech industry' as a major challenge, and R10 advised that leaders must *'recognise what is relevant to [their] organisation and not have an agenda set by someone external.'* Additional concerns included a 'lack of technical fluency to build better systems' (R9) and the rise of 'fear and anxiety, losing control' (R13), which in turn promotes institutional risk aversion

To further contextualise the leadership attributes discussed in this theme, Figure 3 below presents survey results on the leadership qualities most valued by respondents navigating change in uncertain environments.

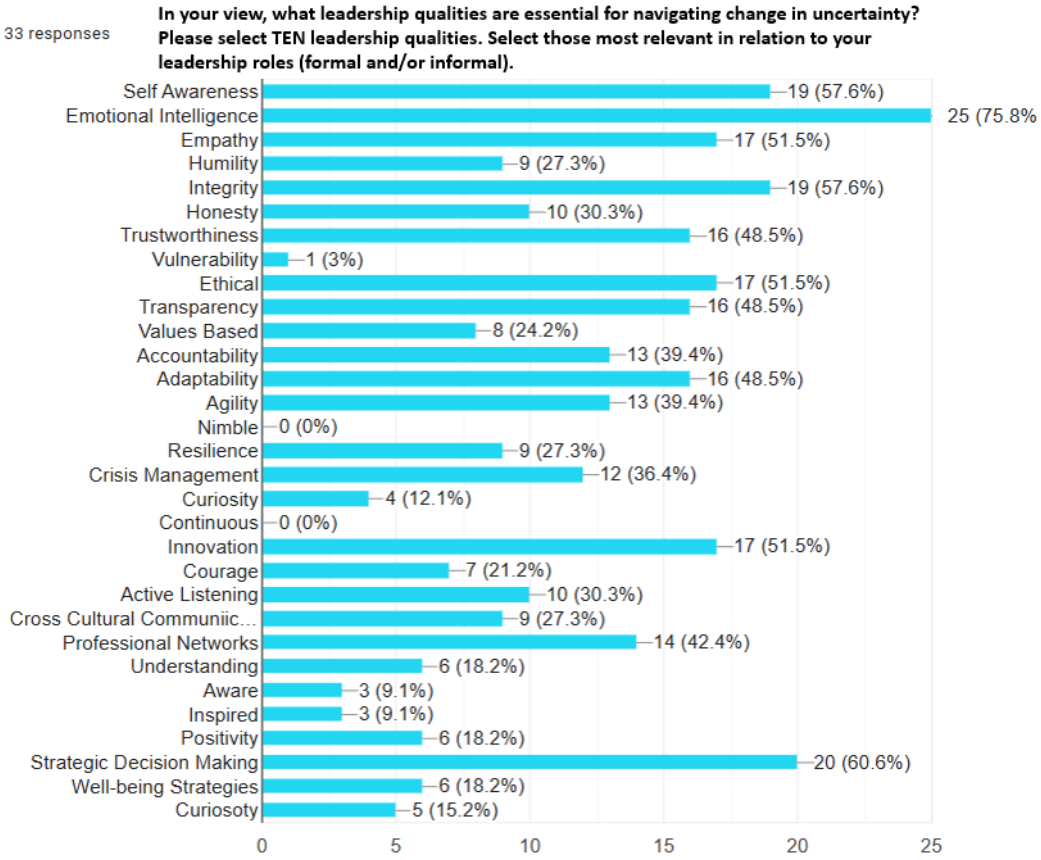


Figure 3. Leadership qualities essential for navigating change in uncertainty (top 10 selections)
© The Authors

While AI presents new possibilities for equity and innovation, the survey also made clear that meaningful impact depends on leadership cultures built on care, integrity, and shared human values

The Importance of a People-Centered & Value-Driven Leadership Culture

The survey responses revealed a deeply held belief among educational leaders that care must be at the heart of leadership. Several respondents highlighted that 'care' involves prioritising the well-being, dignity, and growth of all members of the educational community, including students, staff, teachers, and families. R1 noted, *'Care' means my leaders are aware of what is happening and check in regularly and demonstrate compassion and empathy... support individual goals as well as group goals.'* R2 added, *'Care is being people focussed... empowering them to succeed.'*

Respondents emphasised the importance of psychological safety and empathetic leadership. R3 explained, *'Care means ensuring psychological safety for students to learn to the best of their ability... alongside marks and results.'* Similarly, R4 stated that caring leadership is *'a compassionate, inclusive and responsive approach... where individuals feel seen, valued and safe.'* R5 highlighted that care encompasses *'empathy, ethical responsibility and a commitment to justice that ensures no one is left behind.'*

Humanising leadership and transparent communication were also seen as central to caring leadership. R6 observed, *'Leaders who lead with mindfulness foster resilience and cohesion...'* and R7 concluded, *'Ultimately, caring in educational leadership is about humanising leadership, putting relationships, dignity and collective growth at the heart of decision-making and action.'* This emphasis on people was reinforced by R8: *'Care means demonstrating genuine concern and compassion for all members... including students, teachers, staff, and families.'*

Beyond emotional intelligence, care was tied to integrity and inclusion. R9 stressed involving team members in decision-making and ensuring fairness, while R10 reflected, *'Care is being fair, empathic and kind... Strong values.'* R11 summarised the essence of care as *'leading with empathy, integrity, and inclusivity, especially when certainty is absent.'* This was echoed by R12, who explained that care includes advocating for equity and ensuring access for those most affected by uncertainty.

Respondents also emphasised a values-driven approach to leadership. R13 asserted the importance of having *'clear organisational values that serve as decision-making anchors.'* R14 remarked, *'Visionary leadership that aligns strategic planning with core values helps institutions stay ahead of disruption...'* and R15 emphasised the role of transparent communication in creating stability during uncertainty. R16 cited how their institution revised policy on AI to align with equity values, which built trust and ensured alignment with student safety.

Innovation and adaptability were also described as critical components of people-centered leadership. R17 explained, *'By empowering educators and students to create solutions, leaders can turn uncertainty into opportunity.'* Others, like R18 and R19, emphasised building innovation hubs, fostering a culture of curiosity, and testing new technologies through pilot programs. R20 captured this sentiment by stating, *'A culture of care, curiosity, and challenge empowers educators and students to adapt, innovate, and thrive together in an ever-evolving educational landscape.'* Building on this values-driven foundation, respondents also called for leadership that does not wait for change but actively anticipates and shapes it, placing strategic foresight, curiosity, and continuous learning at the core of institutional resilience.

Proactive Shaping of Change: Strategic Foresight, Curiosity, and Lifelong Learning

The survey responses revealed a strong belief that educational leaders must go beyond reactive approaches and instead actively shape change through strategic foresight and intentional planning. Respondents emphasised the importance of scanning the environment, listening closely to stakeholders, and preparing institutions for future challenges. As one respondent noted, *'Leaders need to be very aware of international cooperation and be very attentive to monitoring the environment'.* Another responded, *'Instead of waiting for change, they should stay informed and actively listen to stakeholders, taking all comments and feedback into consideration.'*

Proactive approaches were also described in terms of establishing flexible frameworks and fostering institutional readiness for innovation. This includes building cultures of experimentation and openness to new practices. For example, one participant advocated for *'building a culture of safety and openness in the educational space… building a learn[ing] culture within for capacity building.'*

A second dominant thread in the responses was the value placed on **curiosity** as a driver of leadership and institutional resilience. Leaders were encouraged to embrace uncertainty as an opportunity for exploration and growth. As one respondent explained, *'We need to create a culture of curiosity where new is not scary but something to be explored and investigated. We need to go beyond the theory and put things into practice. Be bold!'* Others supported this perspective, highlighting the need to avoid stagnation: *'Collaborate and experiment. There is a tendency to lock down during times of uncertainty, but I feel the best course of action is action, to experiment, explore and go into the new, and to share that experience.'*

The discussion of curiosity frequently intersected with calls for innovation and shared leadership. Respondents recommended establishing innovation hubs, piloting new technologies, and engaging staff and students in co-designing solutions. This culture of curiosity, as described by one respondent, *'empowers educators and students to adapt, innovate, and thrive together in an ever-evolving educational landscape.'*

Finally, the survey highlighted the importance of **continuous learning and development** for both individuals and institutions. Investing in ongoing professional development was seen as critical for managing technological change, fostering inclusion, and supporting adaptive leadership. One respondent wrote, *'Prioritising continuous learning and development'* is vital for building capacity and resilience. Another explained how leaders should be *'preparing themselves and their faculty and the entire institution on AI, emerging technologies, and new pedagogies. Creating space within their institutions to lead innovation-focused initiatives.'*

Overall, the findings underscore that future-ready leadership is built on proactive strategic planning, a culture of curiosity, and a deep commitment to lifelong learning. However, as many respondents noted, cultivating innovation and continuous learning is not enough, deep-seated structural challenges such as funding limitations, policy inertia, and institutional resistance continue to impede meaningful and scalable change.

Challenges Beyond Technology: Funding, Resistance, and Governance

The survey responses revealed that achieving inclusive, scalable, and sustainable education in uncertain times demands far more than the adoption of new technologies. Respondents emphasised

that persistent structural barriers, such as limited funding, inequitable access, resistance to innovation, and ineffective policy environments, present critical challenges for educational leaders seeking to drive lasting transformation.

Securing sustainable funding emerged as a recurring concern. Several respondents noted the fragile financial foundation underpinning many educational initiatives. *'Securing sustainable funding due to economic pressures'* was repeatedly mentioned, alongside reflections such as *'Lack of funds'* and *'Funding of scalable innovation is still scarce.'* Others described how *'Limited funding, fragmented policy environments, and unequal access to infrastructure also hinder scalability.'* One respondent critically observed that while leaders may support innovation in theory, they *'do not invest enough in innovation and development funding that is long term and allows for lasting change. Short term funding and financing of projects and pilots is much safer but it also does not necessarily lead to big changes in education.'* To strengthen advocacy for long-term investment, another added, *'Seeing real economic value in change for inclusive, scalable, and sustainable education. This element is not pushed hard enough in these circles.'*

A second significant challenge was digital inequality and a lack of infrastructure. Respondents described the continued difficulty of ensuring equitable access to education, particularly in under-resourced communities. Phrases such as *'Digital divide'* and *'digital inequality'* appeared frequently. One respondent explained the scale of the issue clearly: *'One big challenge for leaders is making sure everyone can learn equally, especially in places with bad or no internet or not enough resources.'* Others agreed, citing *'unequal access to technology and resources'* and *'limited infrastructure'* as critical obstacles to education equity.

The responses also highlighted resistance to change as a major leadership hurdle. Phrases such as *'*resistance *to change'*, *'unwillingness to accept innovation'*, and *'closed mindedness and the dislike of change'* revealed a cultural inertia that can prevent institutions from adapting to evolving educational landscapes. One respondent observed that some organisations *'do not have a culture of learning organisation,'* making adaptation even more difficult.

Leadership deficiencies and policy fragmentation were also described as significant impediments. Respondents noted that *'policies may not allow many aspects needed for sustainable education'* and described *'policy and funding environments [that] perceive the changing environment in terms of threatening the status quo, rather than as providing opportunity.'* Respondents voiced concern that *'policies are lagging behind,'* while others pointed to a *'lack of ambition; lack of democracy in governance; a very rigid frame of mind; [and] a culture of risk-aversion.'* A sense of hesitation and fear was also apparent: *'There is fear and anxiety…losing control. This makes leaders risk averse,'* one said. In some cases, key stakeholders were described as being *'stuck in the old paradigm'* at a time when *'new paradigmatic approaches'* are urgently needed.

In this context, the leadership quality of **'Challenge'** was repeatedly described as essential. Respondents described challenge not just as adversity, but as an invitation to push forward, question legacy systems, and transform educational futures. One stated plainly: *''Challenge' means having the courage to question the status quo, overcome systemic obstacles and lead transformative change.'* It was also defined as *'pushing boundaries, taking informed risks and tackling difficult issues,'* particularly *'inequality, digital divide and outdated practices.'*

In the face of uncertainty, respondents called for courageous leaders who *'stand firm on values, make ethically based decisions and champion long-term sustainability over short-term convenience.'* Others saw challenge as a catalyst for personal and institutional growth: *'Leaders need to be uncomfortable and not rest on their laurels. Good work is hard and challenges are how we learn and grow.'* Perhaps most powerfully, one participant framed the challenge of uncertainty as both a necessity and an opportunity: *'Challenge in educational leadership is about driving meaningful change and empowering communities to learn, adapt and thrive in an ever-evolving world.'*

These challenges go beyond technology, demanding leadership grounded in integrity, long-term vision, and systemic change. Yet respondents consistently pointed to collaboration and shared leadership as powerful drivers of sustainable transformation.

The Power of Collaboration and Shared Leadership

The survey responses revealed that inclusive, scalable, and sustainable educational change depends on strong collaboration and shared leadership. Respondents emphasised the importance of engaging a wide range of stakeholders, empowering teams, and fostering international partnerships to support innovation and resilience in education systems.

Collaboration was described as fundamental to meaningful change. Respondents highlighted the need for *'consultation with all stakeholders'* and a *''hands-on' approach to understanding what the key issues are within the educational institution.'* Leaders were encouraged to *'engage stakeholders early to co-design adaptive strategies that align with long-term goals,'* and to recognise that education *'is not a silo, but also involves all stakeholders, such as students, parents, communities, NGOs, businesses, international organizations, governments, etc., both nationally and internationally.'* Building *'robust stakeholder relationships'*, encouraging *'stakeholder dialogue'*, and ensuring that *'learners need to be involved at all levels and board within the institutions'* were seen as vital strategies. Several respondents noted the importance of leaders *'talk[ing] to experts, teachers, and students to understand different views before making decisions.'* Cross-sector collaboration was also viewed as key: leaders were urged to *'build strong partnerships,'* promote *'Public–Private Partnerships,'* and pursue *'cross-sector collaboration.'* The presence of *'willing partners and stakeholders in the area of innovative education'* was regarded as a major opportunity.

Shared leadership and empowerment were also emphasised. *'Empowering teams and individuals'* was the most frequently selected leadership focus for achieving both immediate and long-term success. Leaders were advised to foster *'empowerment of teams... providing both autonomy and fostering agency,'* and to *'place your trust in the team you assemble,'* as *'it's by empowering others that real leadership is developed.'* Respondents supported *'encouraging autonomy in decision-making'*, with many rating it as 'very important' or 'important.' Empowering educators and students was seen as essential, along with *'empowering others through shared leadership.'* Through *'distributed leadership'*, institutions can foster *'collective ownership of change, making it more effective and timely.'* One respondent urged leaders to *'encourage everyone to take a leadership role at their level so that each individual can take responsibility and feel part of the challenges, but also part of the solutions.'*

International collaboration was identified as a strategic imperative. Respondents stressed that leaders *'need to be very aware of international cooperation,'* and that *'international collaboration, integration and sustainability are critical.'* Maintaining *'a wide global network in HE to share concerns, context and*

best practices' was seen as important for keeping pace with change. Since 2023, many had observed an *'increased international cooperation,'* and called for more opportunities for *'learning from each other and borrowing ideas, methods and practice.'* Some also recommended *'more globally open courses to bring perspectives from other countries.'*

These findings reaffirm that future-ready leadership is not a solitary endeavour, it is collaborative, globally connected, and deeply attuned to local and international contexts. In embracing shared leadership, institutions position themselves to scale innovation, sustain transformation, and lead with care, curiosity, and challenge in a glocalised world.

FINDINGS AND DISCUSSION

As higher education navigates a landscape shaped by generative AI, social fragmentation, and global uncertainty, the imperative for leadership to evolve is undeniable. This moment calls for a human-centred model that moves beyond technical competence and managerialism. The Three Cs, Care, Curiosity, and Challenge, offer a strategic and ethical framework for leading with empathy, integrity, and purpose in unpredictable times. They speak not only to what leaders must do, but to who they must become.

The survey findings illustrate that Care is a non-negotiable foundation for effective leadership. Respondents consistently emphasised the importance of leaders who prioritise wellbeing, inclusivity, and emotional intelligence. They described the need for leaders to act with empathy and build trust by acknowledging the pressures staff and students face in digitally transforming institutions. These views align with Beresford-Dey et al. (2024), who argue that care must be understood as a strategic leadership stance, one that shapes institutional culture, not just interpersonal dynamics. It also reflects Harris et al.'s (2024) view that inclusive, responsive leadership is essential for maintaining professional autonomy and human dignity in AI-mediated environments.

Respondents also made it clear that Curiosity must be modelled from the top. Leaders were described as needing to 'get out and try new things,' demonstrating an openness to experimentation, innovation, and global collaboration. This aligns with Ellis (2024), who advocates for an ecosystemic leadership model where curiosity is embedded across institutional layers—from strategy to pedagogy to infrastructure. The emphasis in the survey on learning from international best practice further supports the call for glocalised leadership: an approach that is globally informed but locally grounded, ensuring relevance without insularity.

Challenge, meanwhile, emerged in the survey as a critical but underdeveloped domain of leadership. Participants highlighted a desire for leaders who are unafraid to take risks, question established norms and lead transformative change with clarity and courage. This resonates with Quaquebeke and Gerpott's (2024) assertion that educational leaders must now develop the capability to 'lead the AI that leads the humans.' The respondents' calls for courageous leadership were not about disruption for its own sake, but about purposeful, principled action that can sustain long-term transformation.

The survey findings also underscored the importance of distributed and collaborative leadership. Participants spoke of trust, shared ownership, and the need for inclusive governance structures that empower teams at all levels. This reflects Tarisayi's (2024) advocacy for distributed leadership as a means to promote system-wide resilience, and Butler and Yendol-Hoppey's (2024) emphasis on reciprocal mentoring and reflective dialogue. The glocalised dimension was also evident, with

respondents highlighting the value of international partnerships, community collaboration, and the integration of diverse perspectives into institutional decision-making.

Taken together, the data suggests that Care, Curiosity, and Challenge are not abstract ideals, they are actionable imperatives that reflect what leadership needs to be: scalable across roles, sustainable under pressure, and glocalised in practice. When leaders integrate these dispositions with emotional intelligence, self-awareness, and ethical vision, they are better equipped to guide institutions not only through uncertainty, but toward a more adaptive, inclusive, and human-centred future.

IMPLICATIONS FOR RESEARCH AND PRACTICE

This study offers both practical and theoretical contributions to contemporary leadership in higher education. The Three Cs framework, Care, Curiosity, and Challenge, emerged as a powerful, values-driven model for navigating uncertainty and technological change. It highlights the need for leadership that is not only strategic but empathetic, emotionally intelligent, and ethically grounded.

For practice, institutions must invest in leadership development that moves beyond traditional competencies to include relational capacity, critical inquiry, and ethical risk-taking. Professional learning programs should explicitly foster the emotional and intellectual agility needed to lead in AI-enhanced, digitally disrupted environments. Leadership practices should be scalable across roles, sustainable under pressure, and glocalised, responsive to local needs while informed by global perspectives.

For research, further empirical studies are needed to test and refine the Three Cs framework across different institutional, cultural, and policy contexts. Future studies should explore how this model intersects gender, culture, and power, and how leaders operationalise these values in real-world decision-making. There is also scope for longitudinal research into how leadership practices evolve as institutions deepen their integration of generative AI.

Ultimately, this study underscores that leadership is no longer defined by authority alone, but by the ability to lead with humanity, foresight, and courage. Embedding the Three Cs into both scholarship and leadership development offers a timely response to the complex, global challenges now reshaping higher education.

LIMITATIONS

Although the survey captured views across various institutional and geographic contexts, the sample size was limited, and responses may not fully represent the diversity of leadership experiences in higher education globally, particularly in underrepresented regions or emerging economies.

The study also reflects a snapshot in time, during a period of rapid change driven by AI integration, and digital transformation. As such, the findings may need to be revisited as institutional priorities and external conditions evolve.

These limitations highlight opportunities for future research, including comparative studies across regions, longitudinal tracking of leadership behaviours, and deeper inquiry into how values-based frameworks like the Three Cs can be embedded and assessed within institutional systems.

CONCLUSION

In a time of accelerating change and uncertainty, higher education leadership must evolve beyond traditional models to meet the demands of an AI-enabled, globally connected world. This study proposes that scalable and sustainable leadership can be meaningfully reframed through the Three Cs, Care, Curiosity, and Challenge. The survey findings illustrate that leaders who demonstrate empathy, emotional intelligence, and ethical integrity are best positioned to guide institutions through complexity with purpose and adaptability. By fostering inclusive cultures, embracing innovation with discernment, and acting with courageous intent, leaders can navigate the tensions of the postdigital era. Ultimately, this glocalised model of human-centred leadership offers a timely and values-driven pathway for shaping the future of higher education.

AUTHORS' NOTES

Based on Academic Integrity and Transparency in AI-assisted Research and Specification Framework (Bozkurt, 2024), the authors acknowledge that Data analysis in this work were assisted by [NotebookLM] (Version as of June 2025)]. These analyses were later reviewed, revised, and finalised by the authors to accurately represent and report the research data. The authors take full responsibility for the integrity and accuracy of the reported data.

Based on Academic Integrity and Transparency in AI-assisted Research and Specification Framework (Bozkurt, 2024), the authors acknowledge that this paper was proofread, edited, and refined with the assistance of CoPilot (version as of July, 2025), complementing the human editorial process. The human authors critically assessed and validated the content to maintain academic rigor. The final version of the paper is the sole responsibility of the human authors.

Sustainable Development Goals (SDGs)

This study aligns most directly with Sustainable Development Goal 4: Quality Education, which calls for inclusive, equitable, and high-quality education and lifelong learning for all. By proposing the Three Cs leadership framework, Care, Curiosity, and Challenge, the study addresses critical elements such as educational equity, digital inclusion, and ethical leadership in the context of generative AI and global uncertainty. It also speaks to SDG 17: Partnerships for the Goals, as it highlights the importance of glocalised, cross-sector collaboration and shared leadership models that can foster innovation and resilience within and across higher education systems. Together, these contributions support a strategic, values-driven approach to advancing sustainable and scalable leadership in education.

Data Accessibility Statement

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Ethics and Consent

Informed consent was obtained for the survey described in this article. All collected data were anonymised and participants participated voluntarily. All procedures were performed in compliance with relevant data protection regulations and institutional guidelines.

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Artificial Intelligence's Impact on Transformative Learning in Higher Education

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ABSTRACT

The rapid advancement of Artificial Intelligence (AI) technologies is fundamentally reshaping contemporary educational landscapes in higher education. Traditional educational paradigms have proven increasingly inadequate for our fast-changing society and the age of uncertainty, whereas AI integration offers promising avenues for educational innovation. This article examines the current status and future prospects of Transformative Learning (TL) integrated with AI technology, as well as AI's comprehensive impact on educational ecosystems. Recent developments in generative AI—particularly large language models (LLMs) such as GPT-4 and Claude—have created unprecedented opportunities for critical reflection and perspective transformation, core components of transformative learning theory. Additionally, the emergence of multimodal AI systems capable of simultaneously processing text, images, and audio enables more holistic educational experiences that address diverse learning styles and preferences. Henceforth, this study provides a complex landscape of how recent AI advances specifically enhance core mechanisms of transformative learning, identifying and synthesizing dual roles for AI in education: as both a catalyst for human creativity and transformation, and as a potential disruptor raising ethical and pedagogical challenges. Through critical analysis of existing literature and emerging practices, this article contributes original insights by filling critical gaps in current educational discourse, advancing both theoretical understanding and practical recommendations for orchestrating digital transformation in educational reform.

Keywords

artificial intelligence, transformative learning, educational innovation, large language models, multimodal AI, educational paradigms

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INTRODUCTION

The integration of Artificial Intelligence (AI) into educational contexts represents one of the most significant technological shifts in contemporary pedagogy (Kasneci et al., 2023). As AI technologies rapidly evolve, they introduce innovative approaches to knowledge acquisition, critical thinking, and perspective transformation—elements central to transformative learning theory (Mezirow, 1991). This intersection between advanced computational systems and established educational frameworks presents both unprecedented opportunities and substantial challenges for educational stakeholders worldwide.

Transformative learning—characterized by profound shifts in perspective, critical reflection, and revised meaning-making—has historically relied primarily on human-to-human interactions and carefully structured learning experiences (Mezirow, 2000). However, the emergence of sophisticated AI systems, particularly generative models and multimodal interfaces, offers new mechanisms to support and potentially enhance transformative educational experiences (Holmes et al., 2019). From automated personalization of learning pathways to AI-facilitated dialogue that prompts critical reflection, these technologies are redefining what constitutes transformative learning experiences in the digital age.

This article examines the evolving relationship between AI technologies and transformative learning theory, investigating how recent technological advancements specifically enable and intensify key aspects of perspective transformation. Moreover, it addresses the complex ethical considerations, potential limitations, and unresolved challenges inherent in incorporating AI into transformative educational contexts.

Through a comprehensive and critical analysis of current practices and future trajectories, this article contributes to educational discourse by synthesizing dual conceptions of AI: as both a powerful catalyst for human creativity and transformation, and as a disruptive force that necessitates careful ethical consideration and pedagogical realignment. By examining this duality, the research offers subtle insights into orchestrating educational reform that remains equitable, human-centred, and pedagogically sound despite rapid technological change.

The following sections provide a comprehensive exploration of these intersections, beginning with a detailed literature review that contextualizes AI within transformative learning theory, followed by an analysis of specific AI applications in educational settings, and concluding with recommendations for future research and practice.

LITERATURE REVIEW

Transformative Learning Theory

Transformative learning theory, first articulated by Jack Mezirow (1978, 1991), describes a process through which learners critically examine their assumptions, beliefs, and perspectives, potentially leading to fundamental shifts in how they interpret and engage with the world. This theoretical framework positions critical reflection, rational discourse, and revised meaning-making as central to significant adult learning experiences (Taylor, 2017). Since its introduction, transformative learning theory has evolved significantly, incorporating elements from constructivist psychology, critical theory, and developmental approaches to adult education (Kitchenham, 2008).

The theory posits that meaningful learning occurs when individuals encounter disorienting dilemmas—experiences that challenge existing frameworks of understanding—and subsequently engage in critical reflection on assumptions (Mezirow, 2000). Through rational discourse with others and integration of new perspectives, learners potentially achieve perspective transformation, resulting in more inclusive, discriminating, and integrative worldviews (Cranton, 2016). This process has traditionally been conceptualized as primarily human-mediated, occurring through facilitated dialogues, critical questioning, and collaborative meaning-making activities (Cranton & Taylor, 2012).

Recent expansions of transformative learning theory have incorporated sociocultural dimensions (Johnson-Bailey & Alfred, 2006), emotional components (Dirkx, 2006), and embodied aspects of transformation (Lawrence, 2012). These developments suggest that transformative learning encompasses not only cognitive processes but also affective experiences, social interactions, and environmental influences—elements that significantly shape how educational technologies might support or inhibit transformation.

Current Landscape of Artificial Intelligence in Educational Contexts

Artificial Intelligence has progressed from relatively simple applications in education, such as intelligent tutoring systems and automated assessment tools, to increasingly sophisticated implementations capable of generating content, facilitating dialogue, and adapting to individual learner needs (Holmes et al., 2022). Contemporary AI systems in education span a spectrum from narrowly focused tools addressing specific learning tasks to comprehensive platforms that integrate multiple pedagogical functions (Zawacki-Richter et al., 2019).

Large Language Models (LLMs) such as GPT-4, Claude, Grok 4 and similar systems represent particularly significant advancements, as they can generate contextually relevant text, engage in sophisticated dialogues, and adapt communication styles based on user interactions (Bommasani et al., 2021). These models utilize transformer architectures trained on vast text corpora, enabling them to process natural language with unprecedented sophistication (Brown et al., 2020). Educational applications of LLMs include personalized tutoring, writing assistance, scenario-based learning, and simulated discussions that prompt critical thinking (Kasneci et al., 2023).

Beyond text-based systems, multimodal AI—capable of processing and generating combinations of text, images, audio, and sometimes video—has emerged as particularly promising for educational applications (Summaira et al., 2022). These systems can address diverse learning styles and preferences, potentially making educational content more accessible and engaging for varied student populations. Examples include AI systems that generate visual representations of abstract concepts, provide audio explanations synchronized with text, or create interactive simulations based on educational content (Xu et al., 2024).

Recent research indicates that AI implementations in education produce varied outcomes depending on design factors, implementation approaches, and contextual variables (Popenici & Kerr, 2017). While some studies report significant benefits in terms of engagement, personalization, and learning outcomes (Chen et al., 2020), others highlight concerns regarding algorithmic bias, reduced human interaction, and potential reinforcement of existing educational inequities (Baker & Hawn, 2022; Reich, 2020).

Ethical Considerations in Researching AI-Facilitated Transformation

Research examining AI's role in transformative learning encounters unique ethical challenges that extend beyond standard research ethics considerations. The potentially profound influence of AI systems on learners' beliefs, values, and worldviews raises questions about autonomy, consent, and the boundaries of acceptable educational intervention (Prinsloo & Slade, 2017).

Informed consent takes on additional complexity when research involves AI systems capable of adapting interactions based on user behavior, as participants cannot be fully informed about experiences that evolve dynamically during the research process (Zook et al., 2017). Similarly, the black-box nature of some AI systems—particularly those utilizing neural networks or deep learning approaches—creates challenges for transparency and explicability in research methods (Kitchin, 2017).

Data privacy presents another significant concern, as AI-facilitated learning typically generates extensive data about learners' beliefs, assumptions, and cognitive processes (Williamson, 2017). Such data requires particularly careful handling given its potentially sensitive nature and capacity to reveal deeply personal aspects of learners' worldviews and meaning-making structures.

Perhaps most fundamentally, research in this domain must navigate tensions between educational transformation as emancipatory (promoting greater autonomy and critical awareness) and potentially manipulative (directing learners toward predetermined perspectives) (Selwyn & Gašević, 2020). These tensions become particularly acute when AI systems designed to facilitate transformation incorporate values, assumptions, or biases—whether explicit or implicit—that influence transformative trajectories (Knox, 2020).

Researchers examining AI in transformative learning contexts have increasingly adopted participatory approaches that include learners in research design, implementation, and interpretation, thereby enhancing transparency and reducing power imbalances inherent in technological interventions (Eynon et al., 2020). Additionally, frameworks for algorithmic accountability and ethical AI design provide valuable guidance for research that respects learner autonomy while investigating transformative potential (Yu et al., 2018).

Theoretical Intersections

The convergence of AI technologies and transformative learning theory presents rich theoretical ground that remains relatively unexplored in current literature. Several potential intersections warrant examination, particularly regarding how AI might facilitate or enhance key mechanisms of perspective transformation (Luckin & Cukurova, 2019).

First, AI systems potentially create or enhance disorienting dilemmas—the crucial catalysts for transformative learning—through personalized scenarios, simulations, or dialogue that challenges existing assumptions (Laros, 2017). Unlike standardized educational materials, advanced AI can dynamically adjust content to target specific assumptions or beliefs held by individual learners, potentially increasing the likelihood of productive cognitive dissonance (Tyagi et al., 2023).

Second, the capacity for AI systems to engage in Socratic questioning, present counterarguments, or model alternative perspectives may support critical reflection processes central to transformation (Holstein et al., 2019). Through carefully designed interactions, AI might prompt learners to examine

underlying assumptions, consider alternative viewpoints, or recognize limitations in existing mental models—all essential components of transformative learning (Sharma et al., 2022).

Third, generative AI potentially facilitates rational discourse—another core element of transformative learning—by simulating diverse perspectives, modelling constructive dialogue patterns, or providing safe spaces for exploration of controversial topics. When designed with appropriate safeguards and ethical considerations, AI-facilitated discussions might encourage deeper engagement with challenging material than some traditional classroom settings permit (Luckin & Cukurova, 2019).

Finally, multimodal AI systems align with expanded conceptions of transformative learning that recognize embodied, emotional, and multisensory dimensions of transformation (Belpaeme et al., 2018). By integrating visual, auditory, and interactive elements, such systems potentially address transformative processes beyond purely cognitive or linguistic domains, supporting more holistic educational experiences (Neelen & Kirschner, 2020).

Despite these promising theoretical intersections, significant questions remain regarding whether AI-facilitated experiences can authentically reproduce the human elements traditionally considered essential to transformative learning (Selwyn, 2019).

AI APPLICATIONS ADVANCING TRANSFORMATIVE LEARNING

Generative AI and Critical Reflection

Recent advances in generative AI, particularly LLMs, have created unprecedented opportunities for facilitating critical reflection—a cornerstone of transformative learning. These systems demonstrate remarkable capabilities for engaging learners in dialogues that prompt examination of assumptions, consideration of alternative perspectives, and recognition of limiting frames of reference (Raiaan et al., 2023).

Research by Summaira et al. (2022) examined how GPT-based systems facilitated critical reflection among undergraduate students through Socratic questioning protocols. The study found that AI-facilitated dialogues produced significant increases in students' ability to identify unstated assumptions in their reasoning and consider alternative interpretations of evidence. Notably, some participants reported feeling more comfortable exploring controversial or sensitive topics with AI systems than in traditional classroom discussions, suggesting these technologies might create psychological safety conducive to transformative processes.

Beyond simple question-and-answer interactions, more sophisticated applications utilize generative AI to create customized scenarios that challenge learners' existing frames of reference. For example, AI systems can generate personalized narrative scenarios that present familiar situations from unfamiliar perspectives, potentially triggering the disorienting dilemmas that Mezirow (1991) identified as catalysts for transformation. Preliminary research indicates such approaches may be particularly effective for promoting perspective-taking across cultural, ideological, or experiential boundaries (Xu et al., 2024).

Critical reflection assistants represent another promising application, where AI systems analyse learners' writing or verbal reflections and provide targeted prompts that deepen reflective practice (Akgun et al., 2022). These systems identify patterns in learners' reflective content—such as descriptive rather than analytical approaches, unexamined assumptions, or limited perspective consideration—

and generate tailored prompts that encourage deeper engagement with transformative processes. Early implementations suggest such tools can significantly enhance reflective capacity, particularly for learners with limited prior experience in critical reflection (Weisz, et. al. 2023).

Despite these promising developments, research also indicates potential limitations and challenges. Studies by Reich et al. (2020) found that without careful design, AI-facilitated reflective dialogues sometimes produced superficial engagement characterized by performative rather than authentic reflection. Similarly, concerns about epistemic authority arise when learners attribute unwarranted expertise or objectivity to AI systems, potentially undermining the development of independent critical thinking essential to transformation (Gourlay, 2021).

Multimodal AI and Holistic Transformative Experiences

While text-based AI systems offer significant benefits for certain aspects of transformative learning, multimodal AI—capable of processing and generating combinations of text, images, audio, and sometimes video—potentially supports more holistic transformative experiences. These systems align with expanded conceptions of transformative learning that recognize embodied, emotional, and multisensory dimensions of transformation (Dirkx, 2006; Lawrence, 2012).

Multimodal AI systems demonstrate particular promise for addressing diverse learning preferences and accessibility needs, potentially making transformative learning experiences more inclusive (Summaira et al., 2022). Research by Chang (2023) examined how multimodal AI-facilitated simulations affected perspective transformation among healthcare students. The study found that immersive scenarios combining visual, auditory, and interactive elements produced stronger perspective shifts regarding patient experiences than text-only case studies, particularly for learners who identified as visual or kinesthetic in their learning preferences.

Recent applications have utilized multimodal AI to create virtual "perspective-taking experiences" that allow learners to engage with complex social issues through immersive, multisensory interactions (Lee et al., 2023). These systems combine natural language processing with visual and auditory components to simulate encounters with diverse perspectives, potentially fostering deeper empathetic understanding than traditional pedagogical approaches. Preliminary studies suggest such experiences may effectively address emotional and relational dimensions of transformation often overlooked in purely cognitive approaches (Belpaeme et al., 2018).

AI-enhanced digital storytelling represents another promising multimodal application for transformative learning. These systems assist learners in creating and sharing multimodal narratives about personal experiences, cultural backgrounds, or professional contexts (Liu et al., 2023). By supporting narrative construction through multiple modalities, these applications potentially facilitate meaning-making processes central to transformation while honoring diverse forms of expression and knowledge representation.

Despite their potential benefits, multimodal AI applications face significant challenges regarding accessibility, technological requirements, and potential sensory overload. Research indicates that poorly designed multimodal experiences may overwhelm cognitive capacity, potentially undermining rather than supporting transformative processes (Mayer, 2020). Additionally, uneven access to the hardware and bandwidth required for sophisticated multimodal applications raises equity concerns that must be addressed for widespread implementation (Reich, 2020).

Adaptive Learning Systems and Personalized Transformation Pathways

Traditional approaches to transformative learning typically apply relatively standardized processes across diverse learner populations, despite significant variations in individual backgrounds, assumptions, and readiness for transformation. Adaptive AI systems offer potential solutions by personalizing transformative learning pathways based on individual learner characteristics, prior knowledge, and ongoing interactions (Holmes et al., 2022).

These systems utilize sophisticated algorithms to analyse patterns in learner behaviour, identify individual assumptions and perspectives, and dynamically adjust content and interactions to support personalized transformative journeys (Zawacki-Richter et al., 2019). Early implementations have demonstrated promising results for addressing key barriers to transformation, including resistance to challenging ideas, cognitive overwhelm, and difficulty connecting new perspectives to existing knowledge structures (Baker & Smith, 2019).

Research by Strielkowski et al. (2022) examined an adaptive system designed to promote perspective transformation regarding environmental sustainability. The system assessed learners' initial beliefs, values, and knowledge through conversational interactions, then generated personalized learning pathways that introduced challenging perspectives at appropriate intervals and connected new ideas to learners' existing frameworks. Results indicated significantly greater perspective shifts compared to standardized curriculum approaches, particularly for learners with strongly held initial positions.

Beyond content personalization, adaptive AI systems show promise for calibrating emotional and cognitive challenge—what Mezirow (2000) described as the delicate balance between support and challenge necessary for transformation. Recent applications utilize affective computing techniques to monitor indicators of learner emotional states through text analysis, facial expression recognition, or interaction patterns, then adjust challenge levels accordingly (D'Mello & Graesser, 2023).

Despite their potential benefits, adaptive systems raise significant concerns regarding algorithmic determination of transformative pathways. Critics argue that when algorithms rather than learners or educators determine which perspectives ensure consideration, transformative learning may become constrained rather than emancipatory (Selwyn, 2019). Additionally, the data requirements for effective personalization create tensions between adaptation quality and privacy considerations that remain largely unresolved in current implementations (Prinsloo & Slade, 2017).

CHALLENGES AND LIMITATIONS

Authenticity and Human Connection in AI-Facilitated Transformation

A fundamental question in AI-facilitated transformative learning concerns the authenticity of transformation processes mediated primarily through technological rather than human interactions. Transformative learning theory has traditionally emphasized the importance of authentic human dialogue, emotional connection, and relational trust in facilitating perspective transformation (Taylor & Cranton, 2012). Critics question whether AI systems—regardless of their sophistication—can adequately reproduce these essential human elements (Selwyn, 2019).

Research by Knox et al. (2020) examined perceptions of authenticity among learners engaging with AI-facilitated transformative learning experiences. While some participants reported meaningful perspective shifts comparable to those experienced in human-facilitated contexts, others described AI

interactions as feeling "staged" or "synthetic" despite sophisticated conversational capabilities. These findings suggest that perceived authenticity varies significantly among learners and contexts, potentially limiting the effectiveness of AI approaches for certain individuals or transformative objectives.

The question of emotional presence presents particular challenges for AI-facilitated transformation. Dirkx's (2006) work on emotional dimensions of transformative learning emphasizes that significant perspective shifts typically involve emotional processes that extend beyond cognitive reasoning. While affective computing advances have improved AI systems' ability to recognize and respond to emotional cues, current technologies remain limited in their capacity for genuine emotional presence or reciprocity (D'Mello & Graesser, 2023). This limitation potentially undermines transformative processes that require emotional resonance or vulnerability.

Concerns arise furthermore regarding the depth and sustainability of transformations facilitated primarily through AI interactions. Longitudinal studies examining perspective transformations in various contexts suggest that sustained transformation typically requires ongoing community support and relational reinforcement (Taylor, 2017). While AI systems might effectively initiate disorienting dilemmas or prompt initial critical reflection, questions remain about their capacity to support the integration and stabilization of new perspectives over time.

Despite these concerns, proponents argue that AI systems need not replicate human connection but rather complement it through distinctive capabilities (Holmes et al., 2022). For example, AI might facilitate initial exploration of challenging perspectives that learners later process through human relationships, potentially creating productive synergies between technological and human facilitation of transformation (Tyagi et al., 2023).

Ethical Considerations: Power, Bias, and Algorithmic Influence

The integration of AI into transformative learning contexts raises profound ethical questions regarding power dynamics, embedded biases, and the boundaries of algorithmic influence on human perspective formation. Unlike traditional educational technologies that primarily transmit predetermined content, AI systems actively shape interactions, determine relevant perspectives, and influence meaning-making processes—raising the stakes of embedded values and assumptions (Williamson, 2017).

Research increasingly documents how AI systems reproduce and sometimes amplify societal biases present in training data or algorithm design (Noble, 2018). When such systems facilitate transformative learning, these biases potentially influence which perspectives receive consideration, how alternative viewpoints are framed, and what constitutes "reasonable" transformation trajectories (Baker & Smith, 2019). While recent advances in bias mitigation techniques show promise, complete elimination of bias remains elusive, particularly for complex cultural and ideological biases relevant to transformative learning (Birhane et al., 2022).

Power asymmetries between system designers and learners present additional ethical challenges. Design decisions—including which topics receive attention, what constitutes productive critical reflection, and which alternative perspectives warrant consideration—encode significant normative judgments that shape transformative possibilities (Knox, 2020). When these decisions occur without transparent justification or diverse stakeholder input, AI-facilitated transformation risks becoming a

vehicle for uncritical reproduction of dominant perspectives rather than authentic emancipatory learning (Prinsloo & Slade, 2017).

Privacy considerations take on particular significance in AI-facilitated transformative learning due to the sensitive nature of data involved. Effective personalization typically requires extensive data collection regarding learners' beliefs, values, and personal experiences—information with significant potential for misuse or unauthorized repurposing (Zook et al., 2017). While privacy-preserving AI techniques such as federated learning show promise for addressing some concerns, tensions remain between personalization quality and data minimization principles (Kitchin, 2017).

Perhaps most fundamentally, AI-facilitated transformative learning raises questions about autonomy and the appropriate boundaries of technological influence on human perspective formation. Transformative learning theory places learner agency and rational self-determination as central values (Mezirow, 2000). When sophisticated AI systems design interactions specifically to influence perspective change—particularly through personalized approaches targeting individual psychological characteristics—questions arise regarding whether such influence constitutes education or manipulation (Selwyn & Gašević, 2020).

Technological Limitations and Implementation Challenges

Beyond philosophical and ethical considerations, significant technological limitations and practical implementation challenges affect AI's current capacity to support transformative learning. While AI capabilities continue advancing rapidly, several constraints merit consideration for realistic assessment of current possibilities and implementation planning.

Natural language understanding remains imperfect despite recent advances, particularly for nuanced aspects of communication central to transformative dialogue (Bender et al., 2021). AI systems still struggle with contextual interpretation, implied meanings, cultural references, and recognition of subtle emotional cues—all crucial elements in transformative discourse. These limitations can produce interactions that appear sophisticated on the surface but lack the deep understanding necessary for authentic transformative dialogue (Marcus & Davis, 2020).

The "black box" nature of many advanced AI systems—particularly those utilizing neural networks or deep learning approaches—creates challenges for transparency and explicability in educational contexts (Kitchin, 2017). When neither educators nor learners can fully understand how systems determine relevant perspectives or generate responses, meaningful oversight becomes difficult, potentially undermining trust essential for transformative processes (Holstein & Aleven, 2020).

Practical implementation faces additional challenges related to technological infrastructure, educator preparation, and institutional integration. Significant disparities in access to necessary hardware, bandwidth, and technical support—disparities that typically disadvantage already marginalized populations. These suggest that without careful attention to equity considerations, AI-facilitated transformative learning risks aggravating rather than addressing educational inequalities.

Educator preparation presents another significant challenge, as effective integration typically requires substantial professional development regarding both technical aspects of AI systems and pedagogical approaches for blending AI with human facilitation (Lukin & Cukurova, 2019, 2022). Research indicates

that without adequate preparation, educators often either avoid AI integration entirely or implement systems in ways that fail to support transformative objectives (Zawacki-Richter et al., 2019).

Finally, institutional structures and policies frequently present barriers to effective implementation. Traditional assessment systems, credit structures, and accreditation requirements often align poorly with transformative learning approaches generally and AI-facilitated approaches specifically (Neelen & Kirschner, 2020). Without institutional adaptation, even technically sophisticated and ethically sound AI applications may struggle to achieve sustainable implementation at scale (Holmes et al., 2022).

FUTURE DIRECTIONS AND RESEARCH AGENDA

Emerging Technologies and Transformative Possibilities

Several emerging technological developments suggest promising directions for future integration of AI and transformative learning. These advancements potentially address current limitations while creating new possibilities for facilitating perspective transformation through technological means.

Multimodal foundation models represent a significant frontier, combining capabilities across text, images, audio, and potentially other modalities within unified architectural frameworks. Unlike earlier multimodal systems that essentially combined separate models for different modalities, these integrated architectures potentially offer more coherent and sophisticated engagement with the multidimensional nature of human experience. For transformative learning, such systems might better address embodied, emotional, and aesthetic dimensions of perspective transformation that remain challenging for primarily text-based approaches (Belpaeme et al., 2018; Li et al., 2023).

Advances in explainable AI (XAI) offer potential solutions to transparency challenges that currently limit critical engagement with AI-facilitated transformative processes (Gunning et al., 2019). Rather than functioning as black boxes, XAI systems provide intelligible explanations for their reasoning, potentially enabling both educators and learners to critically evaluate AI contributions to transformative dialogues. Such transparency aligns with transformative learning theory's emphasis on critical examination of not only content but also processes of knowledge construction (Holstein et al., 2022).

Emerging approaches to human-AI collaborative intelligence suggest alternatives to either human-only or AI-only facilitation of transformative learning (Zhang et al., 2024). These approaches explicitly design for complementary contributions from human and artificial intelligence, leveraging distinctive capabilities of each. For transformative learning, such collaborative approaches might combine AI capabilities for pattern recognition, perspective generation, and personalization with human capacities for emotional presence, ethical judgment, and authentic witnessing (D'Mello & Graesser, 2022).

Extended reality (XR) technologies—including virtual reality, augmented reality, and mixed reality—present particularly intriguing possibilities when combined with AI for transformative learning (Radianti et al., 2020). These technologies potentially create immersive experiences that simulate disorienting dilemmas or perspective-taking opportunities with unprecedented realism. When powered by sophisticated AI capable of adapting such experiences to individual learners, XR might facilitate transformative processes difficult to create through other educational means, particularly

regarding embodied understanding of perspectives significantly different from learners' own experiences (Bustos-Lopez et al., 2023).

Methodological Innovations for Studying AI-Facilitated Transformation

Advancing understanding of AI's role in transformative learning requires methodological innovations addressing unique challenges in this domain. Several promising approaches merit further development in future research.

Mixed-methods research designs combining quantitative effectiveness measures with qualitative exploration of transformation processes offer valuable approaches for this complex domain (Tsai et al., 2020). Future research would benefit from specialized mixed-methods protocols examining AI-facilitated transformation.

Longitudinal studies investigating the sustainability and evolution of AI-initiated perspective transformations represent another crucial methodological direction (Taylor, 2017). Such approaches should incorporate ecological validity considerations examining how transformations manifest in authentic contexts beyond educational settings.

Participatory research methodologies including learners as co-researchers show promise for addressing ethical and epistemological challenges (Eynon et al., 2020). These approaches potentially mitigate power imbalances while generating authentic understanding of AI-facilitated transformative experiences.

Process-oriented methodologies focused on transformative mechanisms rather than merely outcomes provide valuable insights into how AI influences specific aspects of transformation (Hoggan, 2016). These analyses can reveal how specific AI design elements influence critical reflection, assumption recognition, and integration of new frameworks.

Policy and Practice Recommendations

Effective integration of AI into transformative learning contexts requires thoughtful policy development and evidence-informed practice guidelines. Based on current research and emerging understandings, several recommendations are provided for educational stakeholders to consider:

Educational institutions should develop explicit ethical frameworks specifically addressing AI use in transformative learning contexts (Prinsloo & Slade, 2017). These frameworks should address considerations including informed consent for perspective-challenging experiences, transparency regarding AI design assumptions, privacy protections for sensitive data generated during transformative processes, and governance structures ensuring diverse stakeholder input in system design and implementation decisions.

Professional development for educators represents another critical priority, requiring approaches that address both technical and pedagogical dimensions of AI integration (Cukurova et al., 2022). Effective preparation should develop educators' capacities for critical evaluation of AI systems, design of integrated human-AI learning experiences, facilitation of productive reflection on AI-generated content, and support for learners navigating potential challenges in AI-facilitated transformative experiences.

Equitable access considerations demand explicit attention in both policy and practice. Given significant disparities in technological infrastructure, digital literacy, and cultural representation in AI systems, intentional efforts must address potential exacerbation of educational inequities. Policies should incorporate specific provisions for infrastructure development in underserved communities, adaptation for diverse linguistic and cultural contexts, and ongoing monitoring of differential impacts across demographic groups.

Interdisciplinary collaboration represents a crucial recommendation for both research and practice in this domain (Holmes et al., 2022). The complexity of integrating AI with transformative learning requires expertise spanning educational theory, computer science, ethics, psychology, and cultural studies, among other disciplines. Institutional policies should create structures supporting such collaboration, including funding mechanisms, recognition in tenure and promotion processes, and dedicated spaces for interdisciplinary dialogue and development.

Finally, an iterative approach to implementation, characterized by continuous evaluation and adaptation, offers the most promising path forward given the rapidly evolving nature of both AI technologies and understanding of their educational impacts (Wang & Hannafin, 2005). Rather than seeking definitive "best practices" prematurely, stakeholders should establish vigorous feedback mechanisms, expect ongoing refinement, and maintain flexibility as both technologies and evidence regarding their transformative potential continue developing.

CONCLUSION

The integration of Artificial Intelligence with transformative learning represents both unprecedented opportunities and significant challenges for educational theory and practice. This examination of current research, emerging applications, and future directions reveals a complex landscape characterized by promising innovations, persistent limitations, and unresolved questions requiring ongoing investigation and thoughtful implementation.

The potential benefits of AI integration for transformative learning appear substantial. Generative AI systems demonstrate remarkable capabilities for facilitating critical reflection through personalized dialogues that prompt examination of assumptions and consideration of alternative perspectives. Multimodal AI offers promising approaches for addressing diverse learning preferences and engaging emotional and embodied dimensions of transformation often neglected in traditional educational approaches. Adaptive systems show potential for personalizing transformative learning pathways based on individual characteristics and needs, potentially increasing accessibility and effectiveness of transformative experiences across diverse learner populations.

Simultaneously, significant challenges and limitations need careful consideration. Questions regarding the authenticity of AI-facilitated transformation, particularly concerning emotional presence and relational dimensions of transformative processes, remain largely unresolved. Ethical concerns regarding embedded biases, power asymmetries, privacy implications, and appropriate boundaries of algorithmic influence demand ongoing attention from researchers, practitioners, and policymakers. Technological limitations and implementation challenges—including imperfect natural language understanding, transparency issues, and disparities in access—currently constrain AI's transformative potential in many educational contexts.

Moving forward, several imperatives emerge for advancing both understanding and practice in this domain. Methodologically rigorous research examining both processes and outcomes of AI-facilitated transformation remains essential, particularly studies incorporating longitudinal, participatory, and mixed-methods approaches. Policy development addressing ethical considerations, equitable access, and educator preparation requires prioritization to ensure responsible implementation. Perhaps most fundamentally, maintaining critical awareness of both transformative possibilities and limitations of AI integration—avoiding both uncritical techno-optimism and reflexive resistance to innovation—offers the most promising path toward educational approaches that harness technological affordances while preserving human values essential to meaningful transformation.

This analysis suggests that AI will neither wholly revolutionize nor fundamentally undermine transformative learning, but rather introduce new dimensions requiring thoughtful integration with established educational wisdom. The most promising future likely lies not in AI replacing human elements of transformative education but rather in carefully orchestrated complementarity between technological and human contributions to learning experiences that support perspective transformation appropriate for our increasingly complex and rapidly changing world.

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Digital Curation, Open Science, and the Context of Educational Repositories

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ABSTRACT

In this article, we analyse the digital curation model adopted by the EduCAPES Portal, a platform dedicated to the dissemination of Open Educational Resources (OER) within the scope of the Open University of Brazil. We argue that the context of educational repositories presents opportunities for interactions between open science, digital curation, and OER. We conducted an analysis of the content available on the EduCAPES Portal through its official website (https://educapes.capes.gov.br), identifying the curation model employed, with an emphasis on the criteria for selecting and incorporating OER. In parallel, we examined the organization and structure of the content, the metadata associated with the resources, licensing information, and the portal's institutional guidelines. We also investigated the visibility of the topic of digital curation within EduCAPES by surveying documents in academic databases, such as Web of Science, Scopus, and Google Scholar. The results indicate that, although digital curation is not explicitly addressed in the analysed content, the portal stands out as an aggregator of OER, reinforcing the importance of analysing its selection criteria. The transparency of these criteria, although not treated as a central aspect, contributes to the repository's reliability, favouring the reuse, adaptation, and repurposing of OER. The findings suggest that the context of educational repositories drives advances in the production, organization, and use of educational data. Thus, we highlight the need for studies that further explore the challenges faced by repositories in OER selection and the interaction between open science, digital curation, and educational practices.

Keywords

online repositories; open educational resources; educational technology; open access; open education; open science; eduCAPES; learning objects; education; open license.

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INTRODUCTION

Digital curation in educational repositories and open educational resources (OER) are presented in an associative way when concepts involving selection, organization and maintenance are intertwined with the discussion of free access, reuse, reuse and adaptation of information resources. The digital curation presented by the Digital Curation Center (DCC) involves maintenance, preservation and the process of adding value to digital data, which points to a cycle that has a continuous process (2025). In this context, we see it as opportune to assign cyclical evaluation to the management of open educational resources that are the result of a selection process. And so, the consolidation of the use of selected OER as open access materials, which allow 'reuse, repurposing, adaptation and redistribution by third parties' (UNESCO, 2025), and strengthen possibilities for new productions in the context of open science.

The transparency of the curation model established in educational repositories is an aspect that promotes reliability, but it is also a challenge, which involves the organization of the repositories themselves and the data they contain. Curation in educational repositories can involve prior actions, such as defining institutions or professionals to validate the resources before they are made available in the repositories, or even remain during the use phases, through 'strategies aimed at collecting impressions about use and evaluations by the community of users (and sometimes also experts) who frequent these environments' (CIEB, 2017, p.15). Digital curation in EduCAPES presents collaborative actions, by linking the production of a training context, the dissemination and democratization of access to resources.

Taking the EduCAPES portal as an example, developed to facilitate access to open educational resources produced in the context of the Open University of Brazil, we considered the objective of analysing how the digital curation model adopted by the portal contributes to interactions between open science, digital curation and OER. To understand the curation model and its contribution, we examined the visibility of the Portal's digital curation in scientific production, based on a survey of documents in academic databases such as Web of Science, Scopus and Google Scholar.

We believe that the research contributes to understanding the role of digital curation in educational repositories, the establishment of evaluation criteria, the relationship between metadata in these repositories, search and the relevance of transparency in digital curation activities.

WHAT DOES OTHER RESEARCH ON DIGITAL CURATION IN EDUCATIONAL REPOSITORIES HIGHLIGHT?

Digital curation in educational repositories is highlighted for presenting data that has been selected on the basis of criteria. This proposition emphasizes educational repositories as spaces that enable access to data and the curation process as strategic: 'the curation process is intrinsically related to the ability

to select a quality educational resource to be used in an appropriate way for a specific educational context' (CIEB, 2017, p.5). The discussion relates digital curation, educational repositories and OER to the concept of quality. Evaluation tools, such as the Learning Object Review Instrument (LORI), are highlighted as evaluation concepts that expand the possibilities of evaluating contextualized resources to achieve pedagogical objectives through criteria. Specifically with regard to teaching, the following stand out: training aimed at appropriating content from the digital landscape, updating for an effective training process and developing skills for collaborative work in digital environments. Collaborative work between teachers and students and among students is mentioned in discussions about engagement.

The process of digital curation in the educational field is not only about filtering content, but also about contextualizing and adding value to the curated data.

CONTEXT OF EDUCAPES

EduCAPES is a Brazilian institutional portal, created in 2016 from the institutional initiative of the Coordination for the Improvement of Higher Education Personnel (CAPES), which is a foundation of the Ministry of Education. CAPES's institutional activities are geared towards meeting the objectives of expanding and consolidating Stricto sensu postgraduate studies in Brazil. It also works in teacher training and basic education. CAPES links the objectives of the portal to the formation of the Open University of Brazil (UAB), which is responsible for making available the productions produced within the scope of the courses. The portal's collection includes learning objects, textbooks, articles, theses, dissertations, video lessons, audios, images and other types of material that are openly licensed. In 2022, the Ministry of Education recorded that there were approximately 130,000 learning objects on mobile devices such as tablets and smartphones on the portal.

LITERATURE: CONCEPTS AND RELATIONSHIPS

'What matters is knowing what matters', an objective way of thinking about the curation process, is in the phrase by philosopher Mario Sérgio Cortella (2016). An objective question in the light of this statement: How do we know what matters? What's more, do we understand the challenge of the selection process and for whom the choices we make are intended? As a start, we propose thinking about concepts and understanding curation in the digital scenario and with an educational objective.

The production of excess information links the concept of curation as a 'response' to deal with what Bhaskar (2020) highlights as a problem. And to put it in context, the answer is, according to Bhaskar (2020): 'to select and organize content in a judicious way, giving meaning and context to what is being presented'. Following on a little from the reflection presented by Bhaskar, curation highlights one possibility for dealing with the problem of too much information, and also points to another action, how to involve curated data in increasingly creative and relevant clothing. Digital curation is also presented as a cyclical composition that involves digital preservation, a concept highlighted by (DCC). There are many paths that point to a policy, a model, which ultimately comprises a set of practices that make knowledge more reliable, enabling it to be reused, adapted and repurposed.

When dealing with the issue of digital curation for educational purposes and in the Brazilian context, discussions such as the general competencies of the National Common Curriculum Base (BNCC) can be related to a strategic understanding of this issue in primary education, for example. The mention in this document of the importance of exercising intellectual curiosity, relating to investigation, critical

analysis, among other actions (Brazil, 2017), provides an understanding of the articulation of these issues. Understanding these actions related to the need for digital curation for the selection of pedagogical content means thinking about the pedagogical dimension related to digital curation in repositories of open educational resources. And thus, also understand the role of repositories and educational challenges, as they conceive ideas about education.

The education research agenda, addressed in the Report: 'Reimagining our futures together', when referring to the technological dimension, states that digital resources can produce advances in the understanding, practice and effectiveness of educational methods and approaches. In this way, educational repositories, and more specifically local repositories, in relation to the importance of local learning, comprising contexts, policies, spaces and tools, converge towards the conception of a new agenda for the future of educational research highlighted in the report. This new agenda encompasses local stories, referring to the fact that it starts where teachers and students are (UNESCO, 2022), highlighting the value of local stories, but in agreement that the educational research agenda envisages interaction at various levels, in national and international dialogues and with diverse partners. The local contexts dealt with in this research agenda underpin the analysis of local repositories in this study, highlighting them as strategic spaces for understanding and strengthening this new educational research agenda. Although the topic of digital curation is widely covered in scientific literature, analysis of local institutional repositories still represents gaps within the scope of the research. Future studies could therefore explore local institutional repositories and the challenges they face in greater depth.

It is also important to note that the implementation of digital curation in educational repositories gives open educational resources evidence and assumes that the establishment of criteria promotes the reliability of materials. But it is also necessary to understand that technological infrastructure, production context, production criteria, validation of OER by peers, among other aspects, have an impact on the quality of resources in repositories. And so having access to the OER in repositories cannot be taken as a totalizing aspect that guarantees the quality of the materials.

Furtado (2019, p.10) proposes a cyclical vision for the use of open educational resources, considering two principles: 'use licenses that allow greater flexibility and legal use of teaching resources; and technical openness, in the sense of using formats that facilitate the use and manipulation of resources in various software'.

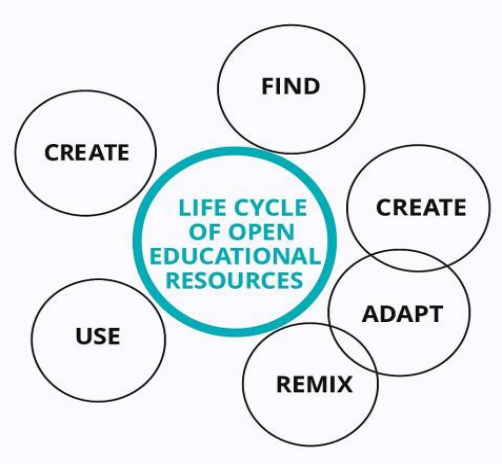


Figure 1. Life cycle of Open Educational Resources, Furtado (2019).

The life cycle of educational resources can initially be a product developed as an original proposal, or even be assigned remixing and adaptations to available products. These production actions involve authorial work, permitted under an open license. The cyclical movement presented by Furtado (2019) understands that in the adaptation and remixing stages, improvements can be implemented, constituting a collaborative nature of resource production, as well as peer review.

In this sense, educational repositories are potential spaces for collaboration in the implementation of available resources. This endorses the understanding that the movement of the OER life cycle is based on a process that is also evaluative and involves various actors. Repositories or educational resource platforms can attribute to the OER evaluation process the typification presented by Hilén (2006), who conceives of two dimensions of the evaluation process: closed and open and centralized and decentralized.

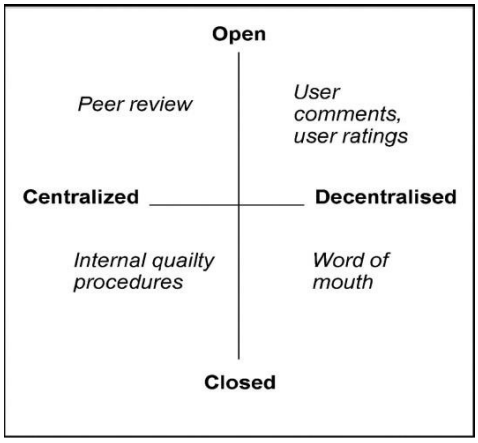


Figure 2. Quality assessment of OER, Hylén (2006).

Based on the typification of figure 2 presented as a model by Hylén (2006), OER repositories and platforms can design evaluation structures that adopt institutional prestige and this criterion is implicit based on the reputation of the institutions. Or even assign an evaluation analogous to the scientific production scenario, a characterization of peer review. Other repositories or platforms can measure the quality of OER based on users' experiences of using them. This can be linked to the curatorship established in repositories, reflecting closed and open models, as well as models of centralization and decentralization.

We would also highlight the strategic role of educational repositories in the face of budgetary constraints. The Brazilian government's Ministry of Education (MEC) released news in the second half of 2025, explaining that budget restrictions led to the acquisition of only Portuguese and Mathematics textbooks for basic education and this decision highlights the shortage of textbooks in other subjects:

> Considering the challenging budget scenario and the unequivocal importance of maintaining the PNLD for public education in Brazil, the FNDE adopted staggered purchases as a strategy for elementary education, meeting a demand from the school networks and in line with the evaluation of the program's pedagogical teams, starting with the areas of Portuguese Language and Mathematics, and later complementing with works from the other areas. Purchases for the EJA, whose bidding process is in its final stages, are guaranteed. The strategies for secondary education will be defined later. (Poder360, 2025)

In the MEC note published by the poder360 portal, the impediments that budget scenarios can establish for education and how the scarcity of resources impacts on the effectiveness of the acquisition of teaching materials. Faced with these circumstances, digital educational repositories are strategic alternatives, but not substitutes, for content that can complement or supply access to teaching materials. Thus, repositories are strategic spaces that articulate various areas of knowledge and promote an interaction between themes, digital curation, OER, which are aligned with education and open science. Kelly et al, (2025), analysing research on OER, points out that initially they focused on comparative analyses between the use of OER and teaching materials and later research pointed to analyses focused on the student and the conception of open education that advocates the use of OER. Furtado (2019) makes a direct link between OER and open education when he notes the proliferation of platforms, video channels and courses available online. By highlighting the increase in platform data, we can see the role of repositories in open education and open science practices.

Digital curation and the establishment of criteria that validate the quality of OER strengthens the trajectory of open science, comprising transparency and reproducibility. Regarding open science, Corujo (2020) mentions it as 'an intellectual asset of prime importance, subject to peer review, quality assessment and reuse'. The idea of movement in the cyclical form of the concept of digital curation, the reuse, reuse, adaptation of OER and the review, evaluation and reproduction of open science, we see as points that interact for a dialogical understanding of knowledge construction. We therefore consider that the context of educational repositories presents opportunities for interactions between open science, digital curation and OER, and that they provoke experiences for education, on educational methods and approaches.

RESEARCH METHOD

The visibility and discussion of Digital Curation on the portal was the starting point for the analysis of EduCAPES. Data on scientific production was retrieved from the Web of Science, Scopus and Google Scholar databases. We used a simple search with the terms *digital curation* and *EduCAPES* in Portuguese and retrieved articles, book chapters, books, dissertations and theses. The research is exploratory, with a description of the data analysed from the portal page.

Figure 3 shows the relationship between the amount of data retrieved and the bases used for the search. In the results, the portal is highlighted as a content aggregator, a repository of educational objects and applications, content curation carried out with documents from the portal, curation in the educational field, a document on the curriculum matrix of a distance education course, the relationship between content curation and the BNCC and the relationship between EduCAPES and open science. In the analysis of the documents, the topic of curation presented in the content does not examine the curation structure established on the portal; on the other hand, the discussion highlights the portal as a content aggregator. This data consolidates the relevance of the analysis of curation and the criteria for selecting materials on the portal.

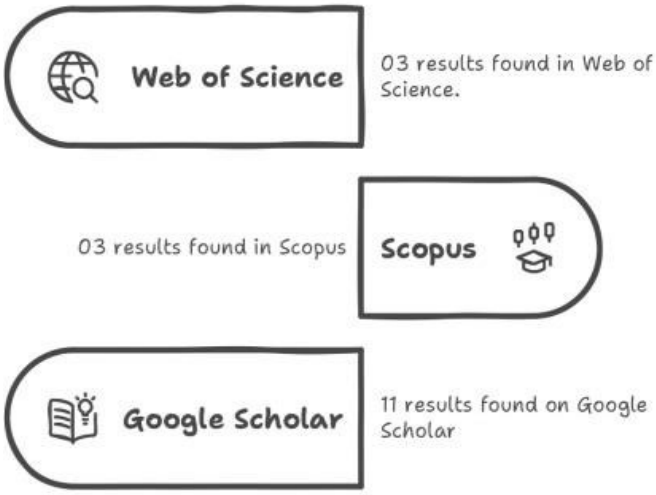


Figure 3. EduCAPES database search results

The visibility of the EduCAPES Portal in scientific production and the approach to digital curation implemented on the portal is relevant to the analysis we propose. The analytical justification is considered to be the strategic role that educational repositories play in open access to knowledge, dissemination of OER and digital curation aimed at strengthening open science. The analysis of EduCAPES involves not only examining the productions linked to the portal, but also the curation model adopted in its structure and operation. Based on the information on the portal's home page, we have highlighted some sections for analysis, which we describe below:

Content Organization and Structure

The conceptualization of the portal, its purpose and origin are presented to clarify the portal's objectives, data on the collection, licensing and technology are mentioned in the section: 'What is EduCAPES'. The policy for inserting materials is also covered, as well as interoperability with other repositories. This section highlights structural information that underpins the repository's policy, making up a general overview, which we detail in the following sections.

METADATA

On the main page, the categorization suggesting a navigation path is also a starting point for searching specific fields, simple and advanced search fields. 'How do I search?' and 'How do I submit my material?' are links that provide details on how to navigate the fields and apply the filters and metadata contained in the documents hosted on the portal. Dublin Core has been adopted as the standard for organizing the portal's metadata. The items are categorized as simple and complete records, understood as an organization standard aimed at retrieval. The simple record field form shows: title, authors and collaborators, other identifiers, document date, type (textual typology), keywords, which appear in the collections. In this form we have a more general description of the item, but on the other hand there is a need for evidence of other metadata that provides more detail, such as the license, which does not appear in this type of retrieval. Despite the presentation of a standard form, there are variations in the way the fields are filled in, and not all the fields appear in the complete form.

The date field provides clues to the flow of documents in other repositories. Taking as an example a document posted on EduCAPES in 2024, but which was created in 2016, the year of insertion in the Repository of origin Institutional Repository of the Fluminense Federal University (RIUFF), an

occurrence that points to *Katia Maria Tavares Da Silva* as an aggregator of productions from other institutional repositories.



Figure 4. Time flow of the document from creation to insertion in EduCAPES



Figure 5. Search results using the descriptor: Digital curation.
Available at: https://educapes.capes.gov.br/simple-search?query=Curadoria+digital%3A+a+new+space%C3%A7+for+the+work%C3%A7%C3%A3+of+the+information+professional%C3%A7%C3%A3&default=

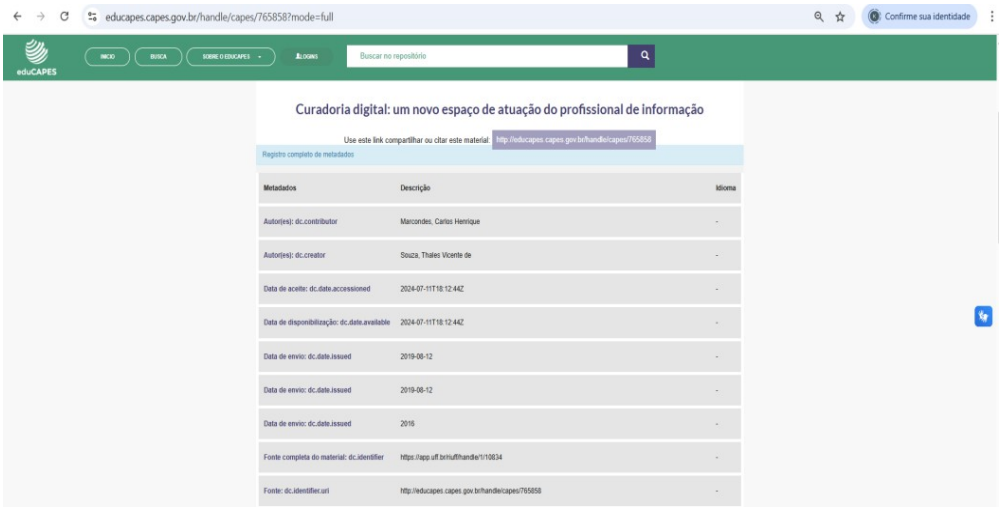


Figure 6. Simple metadata form for the item researched: 'Digital curation: a new area of activity for information professionals'.
Available at: https://educapes.capes.gov.br/handle/capes/765858

The time frame of the document in the fields referring to dates is ambiguous, and there is a lack of clarity in interpreting which date should be attributed in the citation. The date of creation is unclear and there is no unique identifier. There are two persistent identifiers, one for EduCAPES and the other for the Repository of the Fluminense Federal University (RIUFF) and in the field that gives guidance on citation, the link directs to the citation of the date of insertion in EduCAPES. While the preservation and accessibility of documents are important, the management and clarity of the metadata are equally important for the harmonization and coherence of data retrieval. The summary and abstract field, keywords, pagination, format, language, license and textual typology of the item analysed are recorded equally in both repositories. In the source repository, RIUFF, there is an extra piece of information, which is the author's institutional affiliation. The curatorial commentary is strategic for clarifying the flow of production and so, more than technical data, it is a record of the publication's current status. In research whose object of study is historical data, this data is especially prioritized.

Santos (2011) demonstrates, by analysing repositories, examples of materials that do not make the license explicit in repositories with resources in the public domain. The lack of standardization and recording of multiple dates, such as the example of the data document shown in figure 1: date of creation, publication, update, insertion in EduCAPES, makes the timeliness and origin of the content less visible or understandable. Santos' analysis that the organization of repositories should promote the use of digital resources strengthens the strategic role of curation in repositories, by ensuring that metadata fields clearly provide information to consolidate the use, reuse and adaptation of documents.

DATA ON THE LICENSE

The open license underpins the design of OER and establishes reuse, adaptation and repurposing. It is a principle that promotes ‘greater flexibility and legal use of teaching resources; and technical openness, in the sense of using formats that facilitate the use and manipulation of resources in various software’ (Furtado, 2019). The evidence of the license clarifies the conditions of use of the resources, in other words, how they can be used. Thinking about the license is also thinking about the importance of open access. Furtado (2019) also discusses the difference between free and open: ‘A common misconception is that if content is made available for free on the internet, it can be considered open content or an OER’. When referring to the misunderstandings between the two concepts, the author highlights the limitation on the use of free resources, as it does not state exactly how they can be used. EduCapes provides information on the conditions of use and access to resources, but does not highlight the conceptual difference between the discussion of open and free. The Frequently Asked Questions (FAQ) section is divided into themes: Access, Materials, Users, Higher Education Institutions (HEIs), Comments, and we have highlighted the information on access and license below for analysis:

Table 1: Frequently asked questions about the use of content on the EduCAPES portal. Available at: https://educapes.capes.gov.br/redirect?action=faq

QUESTION	ANSWER
How do I access the content of the EduCAPES Portal?	Access to the open materials on the eduCapes portal is free and open to all users. Simply access the portal and browse the materials available on any device with internet access.
Do I have to pay to use the portal?	The portal is free for all users.
Are there any rules for copying, printing or downloading educational objects from the EduCAPES Portal?	The materials made available on the portal must be open, and may be licensed under Creative Commons (CC-BY-NC-AS or less restrictive) or be in the public domain. In this case, the rules for copying, printing and digital storage of the content made available on the portal are those that are socially accepted and legally permitted, according to copyright legislation. The Creative Commons license is a free legal instrument that allows material protected under it to be shared and/or remixed without commercial purposes. To find out more, visit www.creativecommons.com.br .

The conceptual principle of OER, of use, reuse and adaptation is not highlighted in this section and the details of the discussion are attributed to the Creative Commons page, which at the time of analysis (first semester of 2025) the address did not direct to the Creative Commons Brazil page. However, when retrieving documents, there is a tab for Creative Commons, which details the license conditions for the retrieved item.

As an example, we searched the EduCAPES portal using the descriptor 'Digital Curatorship', 73 (seventy-three) documents were retrieved, 5 (five) documents were repeated. Of the number retrieved, 21 present the identification of the open access license in the metadata form, and 47 (forty-seven) present a more generic description of the type of access, for example: 'Attribution-NonCommercial-ShareAlike 3.0 Brazil', despite this record as metadata, the description does not present clarity about the use. In the license field (dc.rights.uri), the license record directs to the Creative Commons address, but does not provide access to the page, http://creativecommons.org/licenses/by-nc-sa/3.0/br/. The clarity of this information is not evident in the main form and knowledge of the conditions of use is limited for users who do not know the guidelines contained in the type of license. One strategy used by the portal was to create a tab at the bottom of the form page to record the information: 'This item is licensed under a Creative Commons License'. Although this link does not appear in all the documents, the details are explored both with guidelines for use and for adaptations.

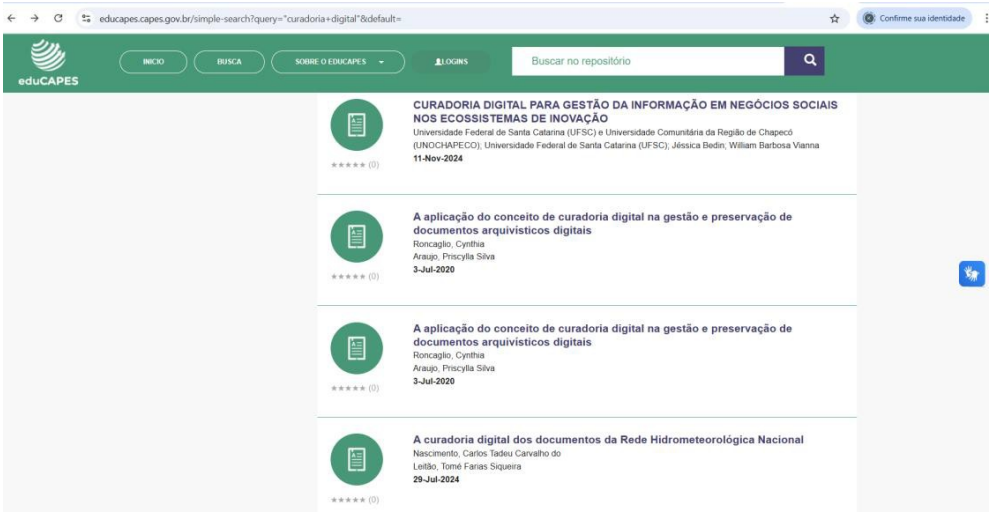


Figure 7. Example of repeated Results: 'The application of the concept of digital curation in the management and preservation of digital archival documents'.
Available at: https://educapes.capes.gov.br/simple-search?query=%22curadoria+digital%22&default=

The repeated documents in the example in figure 7 vary in the 'Appears in collections' field, where the links point to different addresses. This occurrence of duplicate documents in the search results can be interpreted as a result of the collaborative process involved in the submission, as we saw in figure 4, there is no overlapping of the date of the source repository, and this ends up causing a redundancy of records. The multiplicity of records requires greater attention on the part of the user to identify which record to select. In relation to the dimension of data management in repositories, this type of occurrence highlights the complexity of governance in repositories and the relevance of the link between document production, data dissemination and governance in repositories.

The license metadata in EduCAPES is used in a technical way, terms with technical titles in the main form, requiring the user to pay more attention to identify more information about the use of the document, which is in the lower tab of the form. As an educational portal, the evidence of these implications strengthens the need to develop skills in the use of digital resources. In view of these limitations, measures to increase knowledge about the conditions of use of documents have an impact on the consolidation of open education and open science.

PORTAL POLICY

In order to answer the question of what EduCAPES is, the origin is linked to the technological scenario: 'Aware of the expansion of access to the Internet and new media by students, as a result of the process of democratization of information' and from another perspective, the purpose of the space is: to publicize, share and disseminate the training output of the Open University of Brazil. A space with a systemic objective that involves the dimension of training, the flow of open educational resources and various types of documents. Partnerships with other portals, databases and initiatives in the educational field, such as institutional programs, permeate the information published on the Educational Portal, in addition to the documents that are part of the repository's collection. In this way, the portal's political conception is extended beyond a database, promoting interconnections with educational programmes and initiatives.

In the repository, document collections are aggregated by curators with institutional links to the postgraduate programs listed on the portal. Situation recorded as a momentary condition. The curator

is presented as a mediator in the insertion of the Postgraduate Program (PPG) materials listed, at the time we analysed the portal for this research. We consider this to be content that seeks to present terms of use registered on the portal:

Table 2: EduCAPES Portal policy data.
Available at: https://educapes.capes.gov.br/redirect?action=submission

Open access	1. Access to the content of the EduCAPES Platform is unrestricted and there is no need to register to download materials;
Submission Policy	1. CAPES' decision to accept submissions on the platform is discretionary and we are readjusting the criteria for submitting materials;
Institutional autonomy and authorship	1. No Education or Research Institution may demand or oblige its participants to make materials available on the EduCAPES Platform, taking into account the possibility that registration cannot be carried out for any reason. With the exception of the specific Professional Master's courses listed above;
Operational limitations and service	1. Every request depends on the availability of the CAPES team, either the Distance Education Technology Coordination (CTED) or the Information and Technology Directorate (DTI) for this service.
Institutional guidance and local repositories	1. Applicants can check whether their institution has a repository for educational objects and, if so, submit the material to their institution's platform.

Free and unrestricted access to documents is understood as an open access policy. CAPES criteria are the basis for submissions, which may lead to curatorial policy fields, although there is no explicit mention of this. The decision to submit documents is a decision for the authors and EduCAPES is not a mandatory deposit space for the productions of Postgraduate Programs, although it was created to publicize, disseminate and share the production of 'educational materials produced in the courses offered within the scope of the Open University System of Brazil - UAB (EduCAPES).' Another aspect highlighted is the operational limitation of the portal, when 'the availability of CAPES staff' is emphasized, which limits the objective of a broad policy, far beyond a database, but which has gaps in the training of staff to consolidate the expansion of the offer of services for the insertion of documents. Informing authors to submit to local repositories indicates that these spaces are prioritized and that submission to EduCAPES is voluntary without institutional imposition. The curators linked to the programs listed on the portal's page act as mediators in the process of accepting productions submitted to the portal.

Institutional intermediation means that there is control over the materials submitted, with a division of responsibility between the local repositories, represented by the curators of the authors' institutions of origin, and EduCAPES. We also consider the role of users, who are encouraged to participate in the evaluation process a posteriori by pointing out complaints that justify the removal of the document from the portal, at the link: Report inappropriate content register:

> EduCAPES is a repository of educational objects and is not responsible for third-party materials submitted on the platform. The user assumes full and complete responsibility for the originality, ownership and content, citations of works consulted, references and other elements that form part of the material they wish to submit. We recommend that you report directly to the author(s), indicating which part of the material was considered inappropriate (cite page and paragraph) and justifying your complaint.
>
> If you are the original author of any material published improperly or without authorization, you will need to identify yourself by providing your full name, social security number and date of birth. If you have a court order for the material to be removed, please provide the link to the document, as well as any data required for access, in the field below.
>
> All complaints are confidential and your identity will be preserved. The name and e-mail fields are optional. However, if you do not provide your e-mail address, we will not be able to get back to you and/or your complaint may be disregarded if further information is required.
>
> (CAPES, 2025)

EduCAPES institutional policy is not only operational, but also involves an inter-institutional collaborative structure between the participating actors, be they authors, local curators, EduCAPES support and portal users. CAPES, as the proposer of institutional policy, local curators with responsibility for sorting and mediating content, authors with the role of submitting, assigning licenses and describing metadata. Users collaborate by identifying items with inappropriate content and by performing interactions without logging in, such as downloading documents after agreeing to the terms of use. These guidelines from the portal's policy reinforce that the dissemination and preservation of OER is strengthened through cooperative actions.

RESULTS

The analysis of EduCAPES data demonstrates the institutional relevance of meeting the objectives of democratizing access to OER and highlighting the knowledge produced in the training processes of the postgraduate programs of the Open University of Brazil. In this way, the portal consolidates open education and open science, based on the objectives of its creation, and promotes the use and reuse of content, in line with the Creative Commons guidelines. Regarding this aspect of licenses, we observed limitations, identified by variations in records, in the data set, we identified documents that did not present clarity as to the license assigned.

The lack of standardization in the recording of dates in the document used as an example for analysis shows a limitation in terms of understanding its timeliness. Another aspect observed was the duplication of documents in search results, an indication of governance challenges and metadata verification. The points observed have an impact on the autonomy of the portal's users and run counter to what is advocated by open education and the effectiveness of digital curation.

The information collected, which is the subject of the analysis, does not compromise open access, but it does highlight the need for clarity in digital curation and the information recorded in the metadata, and articulation between repositories, considering that these aspects strengthen open science and open education.

CONCLUSION, IMPLICATIONS AND SUGGESTIONS

The analysis proposed in this article sought to shed light on the EduCAPES portal's curation model, in a scenario where this activity is becoming more important but tending to become invisible. If, on the one hand, the curatorship does not make its criteria explicit, the systemic model of organization and the division of responsibilities between CAPES, curators linked to postgraduate programmes, authors and portal users is evident. We believe that the portal's organizational structure promotes control and alignment, since there is mediation in the process of submission and permanence of the materials inserted into the system.

The form is standardized, although not all the fields are filled in for greater expansion and understanding of the database data. This is especially true of licenses, which do not vary. Considering that this record can promote interest based on knowledge of the conditions of use, whether it is interest in use, reuse or adaptation.

We believe that the curator should adopt more transparent practices and highlight the submission criteria. Another important aspect to consider is the history of the creation of the documents, with the aim of making the source data explicit, before the insertion data on the portal, for clarity of timeliness and contextualization. Even though the portal is shown to be an aggregator of OER in conjunction with other repositories.

In addition to its aim of publicizing, sharing and disseminating educational materials, the EduCAPES portal conveys information that represents not only a database, but also network collaboration and learning. To consolidate this purpose, it is important that cooperative practices are aligned with the transparency of the established digital curatorship, geared towards the principles of open science and OER. Thus, the achievement of a research agenda, as stated in the report: ‘Reimagining our futures together’ (UNESCO), centered on purposes rather than instruments.

Implications

Curation plays a strategic role in educational repositories, considering aspects such as transparency, which is in line with the principles of open education and open science. Recording metadata consolidates experiences of use, reuse and adaptation by promoting the identification of data about a document. These aspects strengthen educational repositories and collaborative initiatives in the educational field by contributing to the appropriate pedagogical contextualization of documents and the enhancement of open educational resources.

The research raised significant elements about curation and other analytical dimensions, such as: license, policy, EduCAPES metadata. Our research is exploratory in nature, based on data from the portal itself. We are considering further research based on data collected from the portal's management team.

Suggestions

The exploratory analysis we have presented, based on information collected from the portal, could be further developed in future research, from the perspective of EduCAPES managers and curators. Collecting data that can, in parallel to what is recorded as the portal's guidelines, provide knowledge about the actors involved, whether they are curators and their affiliated institutions, CAPES or users of the system.

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30th International Council for Open and Distance Education World Conference 2025

Using Interactive Oral Assessments for Equity in Postgraduate Online Courses in Aotearoa New Zealand

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1AcademyEX

ABSTRACT

Interactive oral assessments (IOAs) are unscripted oral assessments where teachers and students engage in a conversation. At the heart of these assessments lies the application of theoretical knowledge to real-world, practice-based environments that align to students' envisaged or lived work environments. Acknowledged advantages of IOAs include enhanced authenticity and enhanced academic integrity. IOAs are currently designed and implemented in a Master of Contemporary Education (MCE) programme in Aotearoa New Zealand, where enrolled students are predominantly in-service primary or secondary school teachers. One of the graduate outcomes of the programme is: "Critically engage in a substantial and authentic way with appropriate communities and stakeholders in the context of educational change". Student culturally sustaining practice is developed across all three parts of the programme and, although IOAs might support the authenticity and academic integrity of assessment, it is not clear whether IOAs, in this context, also support equity. This case study evaluates the inclusivity and equity of selected IOAs implemented in the MCE programme, using Siegel et al. 's McCES Framework. Our research builds upon research conducted by Krautloher in an Australian context, proposing both strengths and weaknesses of using IOAs for equity in postgraduate online courses in Aotearoa New Zealand.

Keywords

Interactive oral assessment; Aotearoa New Zealand; higher education; culturally sustaining practice; authenticity; inclusivity; equity; academic integrity; McCES Framework

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INTRODUCTION

The Master of Contemporary Education (MCE) is a postgraduate qualification delivered by academyEX in Aotearoa New Zealand. academyEX is a private training establishment that delivers postgraduate programmes in education and innovation. As its name suggests, this Master's programme focuses on the teaching and investigation of contemporary pedagogical, cultural, digital and leadership approaches. At its centre is a practice -based, learner-focused philosophy. The course is aimed at educators from a range of in-service contexts: early childhood, primary, secondary and tertiary. The programme consists of a hybrid delivery model including in-person and online components. The qualification includes taught courses and a Practice-Based Change Project component that participants implement in their educational settings around a chosen topic. Through this project, educators are encouraged to challenge the status quo in education to bring about a change that impacts their practice and the practice of others. There are full- and part- time options and two cohorts are enrolled each year. Participants come from across Aotearoa New Zealand, representing a diverse range of cultural backgrounds, experience, and age levels.

An ongoing challenge for the MCE team has been designing content and assessments that are culturally sustaining in nature. On average, twenty-five percent of students in each cohort of the MCE identify as Māori and Pacific peoples. Designing ways to enable students to bring their culture into their studies is a priority for the development of the programme. In addition to addressing matters of academic integrity, interactive oral assessments (IOAs) present a far more authentic form of assessment in the MCE programme than traditional written assessments. Our primary interest in implementing IOAs, however, lies in assessing the extent to which they are more equitable than traditional assessments and – more specifically – whether IOAs could be used to support culturally sustaining practice.

LITERATURE

What Are Interactive Oral Assessments?

Interactive oral assessments (IOAs) are unscripted conversations (Sotiriadou et al., 2020) between teachers and students where both parties assume roles in a scenario that is carefully aligned to required real-world knowledge and skills associated with a specific course of study (Tan et al., 2022).

The nature of IOAs demands proactive constructive alignment between assessments and other elements of learning design from the outset. As such, IOAs are closely aligned to course learning outcomes, even though the nominal focus of these assessments are real-word scenarios. In addition, the novelty of the approach demands enhancement of teacher learning design skills and scaffolding of student expectations. In the case of the former, support needs to be provided to teachers in crafting prompts that will enable a wide range of students to demonstrate relevant higher-order skills (Pearce & Chiavaroli, 2020). In the case of the latter, the development and socialisation of a rubric that can guide students towards the demonstration of relevant higher-order skills is equally important (Tan et al., 2022).

Some clearly identified affordances of IOAs have been reported in relevant literature. A first, and possibly most pronounced, affordance is the superiority of IOAs over traditional assessments in foregrounding dialogue and interaction with students (Krautloher, 2024), an attribute that is associated with contemporary workplace environments where collaborative meaning-making is valued above

individual endeavour (Tan et al., 2022). This affordance is most closely aligned to authenticity of assessment (Krautloher, 2024; Shaeri et al., 2021; Sotiriadou et al., 2020; Tan et al., 2022). A second affordance of IOAs is that they encourage academic integrity in an age where artificial intelligence is able to provide finely nuanced responses to sophisticated questions (Newell, 2023; Sotiriadou et al., 2020). Finally, IOAs are perceived to provide more equitable assessments than traditional assessment formats (Krautloher, 2024; Newell, 2023).

IOAs in Higher Education

IOAs have been embraced in higher education environments because they address employability concerns rooted in a perceived disjuncture between the knowledge and skills addressed in higher education programmes, on the one hand, and knowledge and skills required in the work place, on the other hand (Sotiriadou et al., 2020). Notably, skilled communication, collaboration (Tan et al.,2022) and the development of a profession-based identity are associated strongly with work readiness – but not necessarily with associated programmes of study at higher education institutions (Sotiriadou et al., 2020). In response to this disjuncture, higher education organisations have sought to address student acquisition of work-ready knowledge and skills through the design of work-integrated learning programmes. In such programmes, the focus has fallen on authentic learning and authentic assessment (Sotiriadou et al., 2020). It is in this context, focused on authenticity, that IOAs have come to be seen as a valuable form of assessment. As Ward et al. (2023) point out, IOAs have been adopted in disciplines as disparate as computing, education, French literature, and aviation. Furthermore, IOA communities of practice have been established in a range of countries, notably Australia, New Zealand, Singapore, Ireland and the United States of America (Ward et al., 2023).

In the following paragraphs, the value of IOAs in supporting academic integrity, authenticity and equity are examined.

IOAs and Academic Integrity

During Covid lockdowns, characterised (in many cases) by the need for online assessments and the emergence of large language models such as ChatGPT, concerns were expressed regarding academic integrity (Ward et al., 2023). Research conducted by Sotiriadou et al. (2020) found that scaffolded assessment tasks, including the use of IOAs contributed to the prevention of academic misconduct. Specifically, related to the threat of ChatGPT enabled academic misconduct, Newell (2023) argues that the use of authentic, work-related assessments (such as IOAs) provide a potential solution. In this regard, the development and implementation of courses that address academic integrity or codes of conduct have been less successful in addressing misconduct than open discussions between teachers and students regarding the ethical use of artificial intelligence in research, supplemented by the teaching of critical analysis skills and teacher modelling of desired behaviours (Newell, 2023).

More recently, a range of artificial intelligence applications such as Interview CoPilot provide answers to interview questions in real time. Such platforms could be used for academic misconduct. However, the application of student knowledge and skills to scenario-based or real-world challenges in unscripted environments such as IOAs makes such misconduct more difficult. Undoubtedly, applications such as Interview CoPilot will progress rapidly in sophistication and speed over the next few months and years, making them even more amenable to academic misuse.

IOAs and Authenticity

Villarroel et al. (2017) suggest that authenticity is best characterised as addressing matters relating to realism, contextualisation and problematisation. In short, these requirements entail the application of knowledge in real-world environments where context shapes analytical skills and where the combination of knowledge and analytical skills can be used to address work-based problems. Gulikers et al. (2004) propose a five-dimensional framework for the development of work-focused authentic assessments: (1) the assessment task needs to confront students with a work-related problem; (2) the assessment needs to emulate the 'messiness' of physical work contexts; (3) the assessment has to capture the social reality of team-based work environments; (4) the assessment product needs to be equivalent to the quality of an equivalent work-based product; and (5) assessment evaluation criteria need to specify required knowledge, skills and competencies – as well as required levels of student performance. In an evaluation of student perceptions of these five dimensions of assessment authenticity, it transpired that younger higher education students associated authenticity with content knowledge while older students associated authenticity with the extent to which assessments reflected real-world requirements.

As indicated above, numerous researchers view authenticity of assessment, as one of the most compelling affordances of IOAs (Krautloher, 2024; Shaeri et al., 2021; Sotiriadou et al., 2020; Tan et al., 2022). Tan et al. report on the evaluation of IOA authenticity across three university programmes, namely occupational therapy, nursing and air transport management. Fidelity of assessments was evaluated in terms of whether: students could express individualised responses; students experienced assessments as authentic; students gained work-based knowledge and skills. In all of the evaluated assessments, each of these measures was somewhat evident, evident or clearly evident (Tan et al., 2022).

IOAs and Equity

Equity in the context of learning and assessment addresses the extent to which all students are treated fairly and justly (Krautloher, 2024). More precisely, equitable access to learning for disparate groups of students, specifically underserved groups, does not necessarily lead to equitable outcomes for all students (Krautloher, 2024). The challenge is exceedingly complex, given the fact that Eurocentric conceptions shape educational systems in ways that do not recognise alternate, often indigenous, ways of knowing.

For this reason, amongst others, equity in outcomes, specifically for underserved students, is a significant challenge for education systems around the globe (Krautloher, 2024). It certainly is one of the most pressing challenges faced by the education system in New Zealand. Historically rooted systemic challenges have faced Māori and Pacific students for many years, and noticeable disparities exist to this day between Māori and Pacific student achievement, on the one hand, and Pākehā (European) student achievement, on the other hand (Channing, 2024; New Zealand Qualifications Authority, 2025).

IOAs are seen as assessments that offer the possibility of more equitable outcomes than traditional written or oral forms of assessment (Krautloher, 2024; Newell, 2023). The conversational nature of IOAs allows students to present their knowledge in a variety of ways that incorporate and reflect their own funds of knowledge (Newell, 2023). Krautloher (2024) argues that well-designed IOAs meet the requirements stipulated by Siegel et al. (2008) in their McCES Framework for equitable assessment.

The Framework encompasses five principles: (1) language used in learning objectives and in teaching should match language used in assessments; (2) assessments should be comprehensible for all students and should not demand additional reading; (3) assessments should challenge students to reflect on, analyse and evaluate their own work; (4) assessments should allow students to express their knowledge using their own backgrounds; and (5) assessments should scaffold language and support students to negotiate learning that might seem challenging, initially (Siegel et al., 2008).

IOAs, Equity and Culturally Sustaining Practice

The McCES Framework (Siegel et al, 2008) provides a valuable framework for designing and assessing equitable assessments. However, IOAs cannot be equitable in and of themselves – just as pedagogy and technology are not intrinsically equitable. We can only employ IOAs in a manner that has more or less equitable outcomes. In the New Zealand context, where the consideration of equitable assessment has to confront inequitable outcomes across different cultural groups – in addition to the McCES Framework- we need a principle that demands the design and evaluation of assessments that consciously address equitable outcomes for students who identify with non-dominant, underserved groups, particularly Māori and Pacific Island students.

Such a principle can be derived from Paris's definition of culturally sustaining pedagogy:

> I offer the term culturally sustaining pedagogy as an alternative that I believe embodies some of the best past and present research and practice in the resource pedagogy tradition and as a term that supports the value of our multiethnic and multilingual present and future. The term culturally sustaining requires that our pedagogies be more than responsive to or relevant to the cultural experiences and practices of young people—it requires that they support young people in sustaining the cultural and linguistic competence of their communities while simultaneously offering access to dominant cultural competence. Culturally sustaining pedagogy, then, has as its explicit goal supporting multilingualism and multiculturalism in practice and perspective for students and teachers. That is, culturally sustaining pedagogy seeks to perpetuate and foster—to sustain—linguistic, literate, and cultural pluralism as part of the democratic project of schooling. (Paris, 2012, p.95).

From the perspective of equitable assessment practices in contexts characterised by a strong dominant culture and one or more underserved cultures, it seems to us that a simultaneous focus on sustaining one's own culture and acquiring competence in the dominant culture is essential. For this reason, we would suggest that the five principles of the McCES Framework (Siegel et al., 2008) need to be supplemented by a sixth principle, namely that assessments should be designed to encourage students to demonstrate competence in their own culture and competence in the dominant culture.

Conceptual Background

For this reason, we would suggest that five principles of the McCES Framework for equitable assessment (Siegel et al., 2008) be supplemented by a sixth principle in contexts characterised by a strong dominant culture and one or more underserved cultures:

1) language used in learning objectives and in teaching should match language used in assessments
2) assessments should be comprehensible for all students and should not demand additional reading

3) assessments should challenge students to reflect on, analyse and evaluate their own work
4) assessments should allow students to express their knowledge using their own backgrounds
5) assessments should scaffold language and support students to negotiate learning that might seem challenging, initially
6) assessments should be designed to encourage students to demonstrate competence in their own culture and competence in the dominant culture

METHODS

A case study methodology was employed for this study enabling an in-depth analysis of the identified phenomenon, IOAs. The following research questions were identified: (1) How well does the modified McCES Framework enable evaluation of the equitable nature of IOA assessments? and (2) How well does the modified McCES Framework enable evaluation of culturally sustaining practice as a key element of equity?

Ethics approval for the research project was obtained from the academyEX Research, Enterprise and Ethics Group (staff.2024.01) Data were collected through a survey and two focus group discussions. The survey encompassed questions designed to address the extent to which the interactive oral assessments used in the MCE programme satisfied the six principles of the modified McCES Framework. The survey was made available to all students in cohorts that had completed at least one IOA. In response to a request for participation, we received 24 responses to the survey. The survey consisted of both 5-point Likert scale questions, providing relevant quantitative data and open-ended paragraph-type questions designed to elicit qualitative data.

Two focus group sessions were conducted. Convenience sampling was used to identify students who were willing to participate. In response, three students participated in Focus Group A, namely two students who identified as Samoan and one student who identified as Fijian. Six students participated in Focus Group B, five of whom identified as European New Zealanders and one of whom identified as Indian. The focus group questions, again, were designed to address the extent to which the interactive oral assessments used in the MCE programme satisfied the six principles of the modified McCES Framework. Our belief was that data obtained from the focus group discussions would provide a source of evidence that would support evidence derived from the survey and, in so doing, also enhance the believability of our findings. In addition, we felt that the focus group discussions would provide participants with the opportunity to provide more elaborate and detailed responses than they might have provided in the survey, specifically related to matters of equity.

Simple descriptive statistics were used to analyse quantitative data while qualitative data were analysed using Braun & Clarke's (2022) approach to reflexive thematic analysis, where the modified McCES Framework provided the conceptual basis for deductive analysis.

FINDINGS AND DISCUSSION

In the following discussion of findings, responses to the survey and the two focus group discussions are presented under each of the six principles of the modified McCES Framework. Owing to a degree of overlap across the six principles, some data could have been presented under more than one principle.

Match the Learning Goals and The Language of Instruction

Interestingly, neither the survey nor the focus group discussions yielded direct commentary on the alignment of language across learning outcomes, teaching and the IOAs. Yet 20 (87%) of the 24 respondents to the survey agreed or strongly agreed that preparation for interactive oral assessments helped students understand the subject matter – while 18 (81.9%) of survey respondents indicated that their overall experience of IOAs had been positive or very positive. Furthermore, a survey respondent indicated that they had enjoyed their deep learning during preparation for the IOA and had consequently found the IOA discussion to have been less confronting than expected. Although these data do not directly address language alignment across the programme, they do suggest that the majority of students did not find it necessary to comment on this matter. The fact that respondents and participants did not hesitate to identify other potential improvements to IOAs in the programme suggest that they did not experience language alignment across the programme as problematic.

Be Comprehensible for English Learners, Both Linguistically and Culturally

Of the 24 respondents, 17 (73.9%) indicated that the instructions and expectations of the IOA were clear, while 6 (26.1%) respondents indicated that instructions and expectations were somewhat clear.

The fact that instructions and expectations had only been somewhat clear to 6 (26.1%) of respondents indicates that instructions and expectations had not been as clear as we had supposed them to be – having specified these as part of the formal assessment descriptor – and having emphasised these during synchronous online sessions. This suspicion was confirmed through a comment from a participant in Focus Group A that they "*just needed someone to explain certain terms to [them] differently to understand exactly what was expected*".

Nevertheless, both respondents to the survey and participants in Focus Group B agreed the IOAs allowed students to express ideas more naturally and genuinely by using their own contexts as points of reference. A participant in Focus Group B indicated that IOAs "*felt a lot easier to do … and were less stressful*". One of the potential reasons for students experiencing less stress was suggested by a participant in Focus Group A who noted that IOAs did not assess English language skills or formal language usage but rather students' abilities to apply knowledge to their proposed projects.

From this perspective, IOAs were considered to be culturally responsive ("*I think the nature of a discussion based assessment makes it very culturally responsive*"). However, a participant in Focus Group A pointed out that the nature of conversational assessments provided a very basic level of cultural responsiveness and that a more authentic approach might have allowed students to introduce themselves in a culturally appropriate manner. This matter is taken up in more detail under the principle of supporting students to demonstrate competence in their own culture and in the dominant culture. Suffice to say that our initial implementation of IOAs had been shaped by the perception that each IOA should be completed within 10 to 15 minutes (Sotoriadou et al., 2020) and we were conscious of the fact that we had little time to evaluate student knowledge and skills. Clearly, the comments provided above have given us pause to consider lengthening IOAs to provide more authentic avenues for the demonstration of cultural competence.

Challenge Students to Think About Difficult Ideas

Responses to survey questions and focus group questions provided a finely – nuanced picture of the success of IOAs with regard to student challenge. On the one hand, 14 (60.9%) respondents felt that

IOAs had encouraged them to engage more deeply with the topic and had helped them to engage critically with academic literature. On the other hand, 8 (34.8%) respondents indicated that IOAs had only somewhat encouraged them to engage more deeply with the topic and somewhat helped them to engage critically with academic literature. With regard to integrating academic literature effectively into their IOA discussion, only 16 (69.6%) indicated that IOAs had enabled them to do so. We were somewhat taken aback by the latter finding and relied on the more detailed discussion in responses to open-ended survey questions and focus group questions to provide further insights.

The responses to open-ended survey questions and focus group questions did provide a range of anticipated and unanticipated influences on the success of student challenge during IOA discussions. Across survey responses and both focus group responses, participants were unanimous in their view that post discussion written feedback had been valuable and appreciated. In addition, a survey respondent indicated that IOAs had given the opportunity to "*demonstrate confidence*" regarding the subject matter and had helped them to be "*more confident in citing literature in conversation*".

Participants in both focus groups found the casual conversations during IOAs valuable since they indicate to the student "*how much they have taken in and how much they have applied that knowledge to their context*". Furthermore, a participant in Focus Group B argued that highly structured assessments led students to mould their responses to the provided structure, "*whereas IOAs force students to consider what they know on a particular topic*". These responses align well with the perceived value of IOAs in providing an authentic form of assessment (Villarroel et al., 2017; Tan et al., 2022) and also with our expectations of IOAs in terms of encouraging student challenge.

One participant in the Focus Group B discussion indicated that feedback on their response to the first question had indicated that they had 'got it wrong'. This completely flustered the participant and, even though the second assessor tried to guide them back to the discussion, they felt unable to provide their best work during the IOA:

> *Um, I was sort of thrown by the first question, which, um, the feedback was that I had done it completely wrong. That's just what I heard. It probably wasn't quite as bad as how I internalised it. Um, but then I was thrown, and I just didn't really know where to go.*

In response to this participant's comment, another participant stated that providing immediate oral feedback during the assessment can be counter-productive since it might lead to students floundering and not being able to do justice to their knowledge during the rest of the IOA. There are a number of matters that need to be considered in this regard.

Firstly, the impression one gets is that the student had approached the IOA with the expectation that they would have to respond to a set of predetermined questions in a predetermined order. As indicated above, we need to provide more preparation scaffolding to ensure that this does not happen in future. A second matter relates to effective practice in providing prompts during IOAs that enable students to demonstrate the full range of their insights (Pearce & Chiavaroli, 2020). The difficult question is whether prompts are a form of feedback – and under what circumstances such feedback might be justified, given consistency concerns across IOA instances as forms of summative assessment. Such a consistency concern was also raised by a participant in Focus Group B who indicated that during the first IOA he "*was given the opportunity to provide an opening statement, while on another occasion no such opportunity was provided*". Finally, in so far as the desirability of providing feedback during the IOA is concerned, from an equity perspective (as documented below), how does one honour Pacific

Island conceptions of *talanoa* research methodology (Vaioleti, 2006) where discussions are integrally founded on challenging discourse positions? We do not propose to have the answers to all of these questions. Since all respondents found post-discussion feedback valuable and appreciated, it might be that we provide feedback after the discussion only – and review and improve the consistency of prompting techniques across the assessment team.

Elicit Student Understanding

(assessments should allow students to express their knowledge using their own backgrounds)

The requirement of eliciting student understanding entails allowing students to express their knowledge using their own backgrounds. In this regard, 18 (78.3%) of 24 survey respondents indicated that they agreed or strongly agreed with the statement that they felt confident expressing their ideas during IOAs. Furthermore, a survey respondent "*found the assessors very encouraging and willing to run with [their] thinking processes*". The respondent also claimed that they "*gained confidence in [their] knowledge base*". Another survey respondent expressed a similar view, emphasising the fact that they were "*able to share [their] own perspective*". In addition, a participant in Focus Group B indicated that they were given the opportunity to develop ideas and concepts fully, even when they struggled to articulate ideas and had to revise sentence structures several times. ("*So I definitely, um, noticed things like wait time, if I was trying to get an idea out and across – or a rephrase of a question*"). Another response from a participant in Focus Group B emphasised the value of receiving positive reinforcement as this reassured them that they were on the right track. Yet another participant in Focus Group B indicated that they were able to express themselves more authentically in IOAs than in written assessments, where they felt compelled to use more stilted, stylised formal language ("*When I do my written assessments, it just feels like I need to sometimes write in a style that's not me*"). Overall, qualitative responses provided further evidence of positive feedback regarding the ability of IOAs to allow them to express their knowledge in ways that felt authentic and comfortable to them. This finding endorses views expressed in relevant literature to the effect that conversations, by definition, elicit student understanding more effectively (Newell, 2023).

Having said this, two aspects of the way in which IOAs were implemented has given us reason to pause and reflect on potential improvements to be introduced in future IOAs. Firstly, we decided to have two assessors present during each IOA discussion with individual students of whom, one would be the student's advisor. Given the unfamiliarity of IOAs, we felt that the presence of two assessors might provide a more balanced evaluation result than the presence of a single assessor. Unfortunately, a survey respondent felt that the presence of two assessors was somewhat daunting – to which a participant in Focus Group B added that it was even more daunting if the second assessor was someone who the student did not know very well. Ultimately, if students feel daunted by this arrangement and they are not able to express their knowledge freely and confidently, then future IOAs will need to include only the student's advisor since the two parties will already have established a high-trust relationship. For this reason, we do not believe that using third parties to assess IOAs is in the student's interest. From a consistency perspective, all IOAs are recorded for moderation purposes, so that the integrity of the assessment is maintained. Yet this approach does imply that students will not receive feedback from someone outside the advisor-student relationship – which might be desirable.

Secondly, a survey respondent ("*I did not feel that I was able to get across my depth of knowledge*") and a participant in Focus Group B indicated that the IOA discussions were too short to allow them to demonstrate the depth and breadth of their knowledge. There are at least two possibilities that need to be considered in in this case: (1) the discussion time of 15 minutes was too short to do justice to the depth of student knowledge; and / or (2) the prompts provided by assessors were not phrased in a way that encouraged students to demonstrate the depth of their knowledge. Both possibilities need to be examined and addressed in future IOAs.

Scaffold the Use of Language and Support Student Learning

It will be immediately clear that the following discussion includes references to findings that may appear to be similar to findings discussed above under the second principle of the McCES Framework, namely, Be comprehensible for English learners, both linguistically and culturally. In our view, this might stem from a conceptual overlap between the second principle and the current principle. We would suggest that the McCES Framework should be adapted to clarify the differences between the two principles. For the purposes of this discussion, we have focused on linguistic matters in our discussion of findings under the second principle and have focused on findings related to broader student support in the ensuing discussion – though some comments are made regarding the relationship between language and broader student support matters.

Of the 24 survey respondents, 20 (86.9%) indicated that provided resources had helped them prepare well or very well for the interactive oral assessment. In support of this sentiment, respondents to the survey also indicated that they felt they had been offered "*enough support*" and that they had "*felt comfortable*" during IOA discussions and that "*preparation was good*". As indicated by these data, there was a high degree of satisfaction with resources and support provided in preparation for the IOA. In fact, one survey respondent commented on the fact that "*Several – and more frequent – oral assessments*" should "*replace written assessments*". A respondent to the survey even suggested that we "*encourage practice in collaborative groups or breakout rooms to familiarise [students] with the assessment format*".

One aspect of preparation for the IOA discussion that did elicit mixed responses was a preference for a video example of an IOA discussion, rather than the conducting of a mock IOA discussion with relevant students. A comment made by a survey respondent in this regard captures the paradoxical nature of responses on this topic: "*I would recommend watching a recording of one [IOA discussion] – however D did a great teaching session and we basically did one in class in groups – so that worked just as well*". Another survey respondent simply called for an "*example of what it could look like*" – a sentiment echoed by a participant in the Focus Group B discussion. We had consciously decided on not using a video recording, rather modelling an IOA discussion during meeting times. The reason, quite simply, was that we had never before conducted IOA discussions, and we felt that the IOA examples provided by other higher education institutions were not similar enough to our own context to be valuable. For this reason, we decided to model IOA discussions during synchronous class sessions and during a session conducted during one of our bi-annual on-campus face-to-face sessions. It is quite conceivable that respondents who called for a video example may have missed both the class-based sessions and the on-campus face-to-face session. We might, initially, have offered more sessions during which we modelled IOA discussions, and this is certainly something we need to bear in mind as we prepare incoming cohorts for IOAs. In future, we will also have access to recordings of IOA assessment discussions that might be used as examples for future cohorts.

One suggestion from a participant in Focus Group A was that students should be supported to participate in the IOA discussion in their native languages or within a culturally familiar group setting such as *talanoa*. Vaioleti (2006) describes *talanoa* as informal conversation that provides a safe space within which robust conversations can be had. Such student support would indeed be a powerful form of scaffolding. Currently, Māori students are able to engage in the IOA in their native tongue, only because the assessment policy of the institution demands that all assessments should be open to participation in English, Māori and New Zealand Sign Language. In addition, we currently have a member of the assessment and moderation panel that is fluent in te reo Māori. The situation is a good deal more complicated in the case of Pacific Island students whose native tongues might be Tongan, Samoan, Fijian or Niuean – to name only a few. A further level of complexity is provided by increasing numbers of Asian students who, in the interests of equity, should be supported to participate in IOA discussions using their own native tongues. Clearly, the ethical principle underlying this suggestion is compelling but whether it is at all practicable in contemporary resource-poor higher education environments is another matter altogether.

Support Students to Demonstrate Competence in Their Own Culture and in the Dominant Culture

In the New Zealand context, characterised as it is by a dominant culture and one or more underserved cultures, working towards equity of outcomes in education is a strategic priority (Office of the Auditor-General, 2024). In the previous paragraphs we have shown that IOAs can, broadly, satisfy the five recognised principles of the McCES Framework for the development of equitable assessments. However, equity of outcomes in the New Zealand context has to be measured against an additional principle, namely whether students are supported to demonstrate competence in their own cultures as well as competence in the dominant culture. The following discussion focuses on findings that address this requirement. Again, some overlap with the discussion in previous paragraphs is virtually unavoidable.

Of the 24 survey respondents, 21 (91.3%) indicated that IOA discussions had allowed for the integration of culturally diverse / inclusive perspectives. To the extent that support for the expression of culturally diverse and / or inclusive perspectives represents the demonstration of a form of cultural competence, responses strongly suggest that students consider this principle to have been met during IOA discussions.

However, as is evident from responses drawn from focus group discussions, participants considered support for the expression of culturally diverse and / or inclusive perspectives to be only one element of demonstrating cultural competence – and certainly not the most important element.

A participant in Focus Group A emphasised the intimate connection between language and social convention and practices:

> *If we're talking about the language, then we are looking at it as a form of talanoa where, as Samoans, it's the greeting … it's …at the beginning. And in my context, that bit of introducing yourself and forming that connection with whoever I'm speaking to, it's really important in my context right now*.

Another participant in Focus Group A enlarged on this point:

> *At least give me or give us time to acknowledge that because if we're talking about my cultural background, my values and my language, then allow me to do the introduction at the beginning – because there's a* vā *[space] there – there's a* vā *[space] between you and I, and I have always been brought up that, in this instance, you are my teacher. So I must honour that vā [space] between you and I. Even if it's informal, and we then just have a normal korero [discussion], or just a chat in that western sense, I must still honour the* vā *[space] at all times, as Pacifica people. As we say, '*teu le vā*' [nurture the space or care for the relationship between people].*

The participants' detailed explanation about the importance of being able to couple cultural practices with their inherent values and their native languages highlights a critical aspect of cultural comprehensibility, namely the unbreakable ties that bind language to cultural practices and values. Furthermore, the description of the *vā* (the sacred space or relationship) between assessor and student and the obligation to honour that *vā* at all times, is a direct articulation of a deep-seated cultural norm. Ignoring such cultural norms can create a sense of disconnect or even disrespect, undermining the equity of the IOA. We are not suggesting that it is possible to remove all bias from an IOA discussion, but we do need to recognise and reduce bias through a long-term process of getting to know students and communities. Another participant, commenting on an IOA discussion involving leadership theories, provided further impetus to this argument suggesting that students should have been encouraged more strongly to present their cultural knowledge in their cultural contexts as evidence of leadership theories in practice.

A participant in Focus group A comments:

> *Our Pacific perspective on leadership, yeah, okay, we do the servant, we do the agile etc, but how does that look like for us as Pacifica people? What does agile look like in our culture? So for me, it sort of lacked a bit of discussion in those areas… .Maybe if you integrate it like how do we as Māori and Pacifica show those show those leadership approaches for example if we're looking at agile leadership and we know the characteristics of an agile leadership approach – how would we use that approach when we're dealing with students of diverse cultures and Pacific Island Māori – because now when we're dealing with teachers and students from diverse cultures*.

The McCES framework emphasises that assessment tasks should be designed with "sociocultural influences on students' thinking" in mind to reduce bias. The cultural background, which values oral transmission of knowledge and *talanoa* is a natural connection with the interactive, verbal nature of IOAs. This suggests that the format itself can be more culturally accessible for students compared to traditional written assessments, which are often rooted in "Eurocentric origins". This indicates that the depth of cultural integration in the comment – that they wanted was a recognised limitation in the study's current application of IOAs.

A participant in Focus Group A said the following:

> *But what if you're the Pasifika person who doesn't straddle the two worlds and only sees themselves in the Palagi [white or non-Pasifika] realm, and there's no association, or, and again, history, choice, whatever that is, does not have that connection … But because you see that they are Pasifika, there is that automatic assumption that you must know about cultural*

> *relevance and being culturally responsive, because you are Pasifika … we can talk until we are blue in the face about cultural responsiveness, we can because of how we are, but what about those of us who can't? How can we demonstrate to you that I am part of the diaspora of the Pacific, I don't speak, I don't participate in my culture, but I know about culturally responsive.*

This comment highlights a critical area where current assessment practices, even those utilising Interactive Oral Assessments (IOAs), may fall short of achieving true equity. This comment illustrates how such an assumption, however well-intentioned, can create an inequitable assessment environment if it doesn't account for individual differences within a cultural group. If cultural responsiveness is assessed only through the lens of a direct, traditional cultural connection (e.g., speaking the language, participating in specific practices), it disadvantages students who are part of the diaspora and may have a different, yet still valid, understanding of their culture and its relevance. This points to the idea that equity includes making adjustments to accommodate each student's unique requirements, (Siegel et al., 2008).

Following on from the previous comment, another participant highlighted a related challenge: "\

> *If we're looking at fairness, … why can't we have a group IOA? Which is what we do? We are not singular or siloed when we make decisions or when we talk about planning – everything is in a group. So there are ways that you could probably plan or create or design an assessment where you have* talanoa*. So what are the benefits of doing it that way? Or allowing that as an option? Just because we are Pacifica and that's how we operate.*

By designing an assessment that ignores the collective nature of knowledge sharing in some cultures, it inadvertently introduces bias into the relevant assessment. Failing to provide options like multi-lingual assessments or group *talanoa* for groups – for whom these are culturally ingrained practices – could be seen as treating unequal individuals equally', introducing inequitable assessment practices.

CONCLUSION, IMPLICATIONS AND SUGGESTIONS

The findings of this study indicate that Interactive Oral Assessments (IOAs) represent a largely equitable assessment approach, aligning well with the principles of the McCES framework. The study confirms that the McCES framework (Siegel et al., 2008) is an effective tool for analysing and improving assessment equity, particularly for the diverse student population in higher education. By redesigning assessments through the lens of McCES, the study demonstrates that IOAs significantly enhance the assessment environment for students from equity backgrounds.

Students generally reacted positively to IOAs and found them to offer a more natural, intuitive assessment experience, often perceiving them as less stressful than traditional written assessments. IOAs were found to be less structured than traditional assessments, enabling students to have more authentic experience that reflects real-life professional situations. This allowed students to challenge themselves by thinking on their feet and applying their knowledge to unfamiliar scenarios. The dialogue-based nature of IOAs offers students increased confidence in expressing their ideas and an opportunity to develop ideas and concepts fully. Students felt they were able to express their knowledge in ways that felt authentic and comfortable, leading to better insights into their learning journey. Finally, there is a strong sense that IOA discussions allow for the integration of culturally diverse/inclusive content, creating a more inclusive learning environment for all learners.

From a culturally sustaining perspective, however, participant responses were more mixed, given Paris's (2012) definition of culturally sustaining practice as involving the demonstration of competence in one's own culture as well as the demonstration of competence in the dominant culture. To the extent that students were able to draw on their own culture, values and language during IOA discussions, we could argue that IOAs were culturally sustaining assessments. To the extent that IOAs did not offer opportunities for all students to engage in their own cultural forms of discussion initiation, nor were they able to complete the IOA discussion in their own language, we could argue that IOAs are not culturally sustaining assessments. Clearly, the design of IOAs in the MCE programme will have to be reviewed and adapted, as required, through a process of co-construction with our students.

The findings of this study suggest that future applications of IOAs need to extend their cultural responsiveness. This could involve lengthening the IOA timeframe to enable a deeper demonstration of cultural competence and finding ways to honour Pacific Island conceptions of *talanoa*, to provide a space for students to engage with their learning in culturally familiar ways. Supporting students to participate in IOAs in their native tongue, where feasible, presents a practical yet impactful way to enhance cultural equity further.

We acknowledge that this research project is very limited in scope and that our findings are not intended to be generalised to a larger context. We do believe that further research is required regarding the extent to which culturally sustaining assessment is an inherent requirement in evaluating assessment equity through the McCES Framework.

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Tūhononga (Connection), Noho Rangapū (Collaboration) and Whakatutuki (Completion): Graduate Experiences of Distance Academic Mentorship/Research Master's Supervision

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ABSTRACT

Improvements in technology has afforded greater accessibility of master's qualifications, using online modalities to provide research academic mentorship and supervision at a distance. With a long history of providing distance mentorship and supervision, across a range of disciplines, in Aotearoa New Zealand, this study aimed to understand the experiences of ākonga who received their research supervision when studying at distance. Online surveys were sent to 168 master's graduates from three postgraduate programmes, resulting in 50 responses. Demographic, numeric and limited qualitative data was collated and analysed prior to conducting 11 semi structured qualitative interviews. Transcripts of interviews were thematically analysed, resulting in three themes: Tūhononga (connection), noho rangapū (collaboration) and whakatutuki (completion), each with subthemes. The importance of whakawhanaungatanga (relationship building) between ākonga and kaiāko was confirmed by this study but may be difficult if the relationship is solely online. A working collaboration was not discipline dependent; students appreciated supervisors with different perspectives that challenged them. Online supervision facilitated student completion by being flexible, supporting academic development and keeping students on track. The study participants were mostly mature professionals, studying part-time, and therefore benefitted from greater flexibility offered by distance supervision. The findings suggest that the development of an open and trusting supervisory relationship is key to successful completion and can be achieved at distance. Shared passion in the topic and a commitment to teamwork were important factors to students' completion.

Keywords

Distance supervision; mentoring; professional master's programmes; supervisory relationships; supervision pedagogy; thesis completion

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INTRODUCTION

We, the authors acknowledge the Te Tiriti o Waitangi as the founding document of Aotearoa New Zealand. We recognize Māori as indigenous people of the land, and the significance of Māori language te reo as a taonga. Throughout this article we have expressed key concepts in te reo and provided a glossary of terms at the end of article.

This article reports on the findings of a mixed methods study that aimed to explore the experiences of ākonga (learners/students) who received their master's research supervision and mentorship at distance. Ākonga were graduates of three professional master's programmes offered by a single tertiary institution in Aotearoa New Zealand, where distance supervision has been offered over many years.

Since the COVID pandemic the expansion of technologies to facilitate communication at a distance, and their increased accessibility to people in their own homes has contributed to growing demand for master's programmes in New Zealand and has created opportunities for many more providers to offer master's supervision at a distance. While distance supervision of doctoral students is more commonplace in tertiary education, there is a lack of literature to support distance supervision at master's level. The findings of this study highlight the importance of the supervisory relationships between ākonga and supervisors or mentors. These supervisory relationships create the pedagogical basis for reciprocal learning which ultimately affords student success.

Growth and Diversity of Master's Students in Aotearoa New Zealand

Enrolment in master's degrees has grown internationally in recent years with increasing diversity of students enrolling in distance or online learning programmes to achieve post graduate qualifications (Blagg, 2018; Brownlow et al., 2023; Grohnert et al., 2024). While enrolment numbers in bachelor's and doctoral programmes have remained steady, there has been substantial growth in master's programmes in Aotearoa New Zealand over the last 10 years (Education Counts, n.d.). In the decade between 2014 and 2023, graduates of New Zealand Master's (NZQCF level 9) qualifications increased by more than 50%, from 5,115 to 7,935 (Education Counts). Significantly growth in master's enrolment between 2023 and 2024 at 24%, is stronger than any other level of qualification in New Zealand (Education Counts, n.d.).

There is increasing diversity of students participating in tertiary education in Aotearoa New Zealand, and consistently higher participation rates for female than male. Between 2023 and 2024 the biggest change was the 10% increase in students who identified as 'another gender' (Education Counts, n.d.). Ethnic diversity is also growing; while the majority of students enrolled in tertiary education are of European ethnicity, in the last year there has been a small decrease in European students and substantial increase in the number of Māori (5.2% increase), Pacific Peoples (5.4% increase), Asian (6.4% increase) and other ethnicities (5.7% increase).

In Aotearoa in 2024, there were over 18,000 students enrolled in master's qualifications (NZQCF level 9) of whom approximately 65% were female, and 35% were male, other gender was not included in the enrolment data (Education Counts, n.d.). In terms of ethnicity 11.6% identified as Māori, 6.5% identified as Pacific Peoples, 31% identified as Asian, and 7% as other ethnicity (see Table 1).

Table 1. Diversity of Master's Students in New Zealand in 2024

Age and Ethnicity	Māori	Pacific Peoples	Asian	Other	European	Total	%
20-24 years	365	190	905	155	2,695	3,775	20%
25-39 years	885	565	3,565	590	4,410	8,955	49%
40 and over	885	445	1,225	505	3,275	5,660	31%
Female	1,515	839	3,465	730	6,880	11,895	65%
Male	610	365	2,210	510	3,395	6,370	35%
Total	2,140	1,200	5,690	1,255	10,380	18,395	100%
%	11.6%	6.5%	31%	7%	56%	100%	

Master's students are typically older, with the majority (80%) aged 25yrs or over, and 31% aged 40yrs or over. Rather than enrolling in master's programmes immediately after finishing undergraduate courses, many students enrol in master's some years after finishing their undergraduate courses. These students often study part-time, being working professionals with family responsibilities. Together, these demographic factors make distance learning in master's programmes highly desirable.

Distance Learning

Distance learning is defined as approaches to learning that take place when the student is physically distant from their educators and fellow students (Atkinson, 2022). While in the past distance learning often meant asynchronous learning, with improved access to, and functionality of technology, distance learning delivery modes have changed, and include online, face-to-face (via a screen), synchronous and asynchronous learning (Atkinson, 2022). Distance learning allows for flexibility in where and when the learning takes place, within the limitations of course enrolment and duration. Studying master's at a distance is a practical option for many students however there is limited research into master's supervision at a distance especially from the perspective of students.

LITERATURE

The Benefits of Distance Supervision

A review of literature on supervision at a distance in higher education was conducted prior to the study (Miller et al., 2023). The review findings identified the primary benefit of distance supervision were flexibility and accessibility in terms of location, scheduling and jurisdiction over one's pace of learning. The use of technology to support online supervision offers increased flexibility for both supervisors and students. The evolution of digital communication tools has enabled faculty members to maintain oversight and provide feedback through various synchronous and asynchronous platforms, thereby facilitating continuous engagement with students (Miller et al., 2023). Strong supervisory relationships can be achieved through online supervision (Aitkin et al. 2022). Bruce et al. (2008) highlights that distance supervision allows professional students, working in distant locations, to pursue graduate programs without being physically present in a traditional classroom setting. Potentially technology

removes the geographical barriers to higher education and extends the potential for greater accessibility, 'for those for whom it may previously been inaccessible' (Miller at al., 2023, p.73).

For post graduate students juggling study with work, and family commitments, digital learning including online supervision, enables students who cannot attend campus regularly to access and complete master's qualifications (Huet & Casanova, 2021). The flexibility to schedule virtual meetings removes the burden of travel and increases the options for scheduling meeting times (Miller et al., 2023). The use of information and communication technologies, was found to be time effective, providing an efficient format for providing feedback, and reducing the time for thesis completion. When supervision is conducted online, records of interactions can be reviewed to promote further reflection and direction for students. The convenience of online communication via email, social media, twitter and Microsoft Teams Chat resulted in more frequent and informal interactions between supervisor and supervisee, which supported the development of a trusting relationship. Online communication also enables group interactions between supervisors and multiple students, facilitating the development of communities of practice (Miller et al., 2023).

Challenges Associated with Distance Supervision

The review reported some of the challenges associated with distance supervision, such as isolation and loneliness experienced by students who were supervised at a distance (Miller et al., 2023). Andrew (2012) suggests that distance students miss out on the ambiance of the campus and on identification with the university, suggesting that distance supervision could detract from the student experience. Online communication and online written feedback have also been seen as inferior, due to the lack of body language and nonverbal cues (Gray & Crosta, 2019, p. 13). Supervisors report that online communication presents challenges in managing students' expectations of immediate responses (Maor & Currie, 2017). Attention to cultural expectations and practices when using online communication so as not to disadvantage Māori students is important (Rātima et al., 2022). Finally, the use of an ever-expanding range of online technologies in supervision may require additional instruction to students to become familiar with their use, potentially restricting the time available to discuss their studies (Miller et al., 2023).

Pedagogy in Research Supervision

There is no agreement regarding the pedagogy of supervision in higher education. Traditional hierarchical one-to-one apprenticeship pedagogy based on the expert supervisor passing on knowledge to the novice student, have long since been debunked in favour of more 'horizontalizing' approaches (Harrison and Grant, 2015). Critiques of traditional approaches to supervision challenge the power imbalance and paternalism inherent in the supervisory relationship, and support more collaborative interactive pedagogies, involving supervisory teams that provide mentoring to support student autonomy (Harrison and Grant, 2015).

Developing the concept of partnership in supervision, Aitkin et al. (2022) propose a model of participatory alignment in the student supervisor relationship, where the thesis is considered a joint project, and the supervisor fosters independence, without dominating the students' experience. As a dynamic relationship, these authors conclude becoming too close or alternatively too distant may be inhibitory to successful completion. Within the zone of participatory alignment both student and

supervisor work together to create a transformative space where new knowledge is developed and the authority and expertise of both supervisor and supervisee is accepted and encouraged (Aitkin et al., 2022).

In distance supervision, learning is enhanced through "pedagogical interventions" that build on trust and dialogue and is co-negotiated within a framework of reflective practice (Andrew, 2012, p. 51). Whisker et al. (2021) suggested that remote supervision of doctoral students, during Covid 19 created an ecological pedagogy that sits between physically and digital learning, mixes formal and informal activities, and creates the potential for a new pedagogical home. In a study of supervisors' experiences of supervising students with disabilities, Manase and Ngubane (2024) propose that collaborative pedagogies could eliminate barriers to successful completion. These authors draw on Freire (2020) who proposed a humanising pedagogy in supervision, an approach which accounts for vulnerability, students' needs, cultivates capacities, and makes students more capable and productive.

Post- and de-colonial perspectives of supervision recognise the importance of transcultural pedagogies in supervision to guard against assimilation or socialisation into Western knowledge systems (Manathunga, 2023). Such pedagogies allow for mutual exchange of cultural knowledge, "where new knowledge may be developed by students (and sometimes supervisors) as they creatively blend their own cultural knowledge with ideas and theories from a range of Western, Eastern, and Indigenous civilisations" (Manathunga, 2023, p. 271). Similarly in Aotearoa New Zealand, the Māori term Ako, meaning teaching and learning based on reciprocity, also emphasises the importance of strong relationship of mutual respect and trust between ākonga and kaiako. This pedagogical approach empowers ākonga through collaborative and co-constructed approaches to knowledge, where learners' prior knowledge is welcome in the learning environment and built upon to co-construct meaning (Rātima et al., 2022). Kaupapa Māori is a well-established theoretical paradigm, that supports research that privileges Māori beliefs, experiences, understandings and interpretations of the interactions of Māori people upon Māori people and Māori people upon their world.

While diverse in epistemologies these proposed pedagogies of supervision collectively indicate that effective supervision at a distance creates a collaborative learning space that is not physically or geographically bounded, that provides opportunities for transformative, culturally inclusive learning for both student and supervisee.

METHODS

Study Method

Research Aim and Objectives

The aim of this study was to identify the factors that enable successful completion of master's level research when academic mentorship and supervision is provided at distance. Two objectives of the study were 1) to discover the factors that enable successful completion when supervision is online and 2) to explore aspects of online mentorship/supervision ākonga find helpful to motivate progress.

The exploratory study utilized a mixed methods sequential design to obtain both quantitative and qualitative data from successful master's graduates who had experienced distance supervision during their study. While acknowledging the complimentary research paradigms in mixed methods research, a pragmatic approach was taken in the study design to maximise both the breadth and depths of the study findings. The research team comprised faculty members from three departments within one

educational institution in New Zealand, each research team member held a supervisory and senior role in their respective master's programme. Ethical approval for the study was obtained from the Otago Polytechnic ethics committee (#011) prior to recruitment and data collection.

Research Design

Initially a custom designed survey (hosted on the Qualtrix© platform) was sent to graduates from three master's programmes in one institution. Participants were identified from graduation lists, for the seven years from 2017-2023 and emails including the survey link were sent to their last known private email address. Survey questions were based on insights from the literature review (Miller et al., 2023) which assessed the benefits and challenges of distance supervision in higher education. Demographic information was obtained to enable description of the respondent group using tick boxes. Questions addressed supervisory arrangements, flexibility of supervision, opportunities to connect with other students, benefits of distance supervision, level of academic and cultural support. In addition, free-text boxes permitted limited qualitative comments.

At the end of the survey respondents were offered an opportunity to participate in a one-to-one interview to discuss their experience in more detail. Interviews were conducted after the initial analysis of the survey results with questions developed to obtain in-depth perspectives of the distance supervision experience.

Research Group

Online surveys were sent to 168 master's graduates from three postgraduate programmes, resulting in 50 responses. All survey respondents were offered an interview which were conducted kanohi ki te kanohi (face to face) either in person or online using the Microsoft Teams platform, with allocation of participants to researchers outside of their discipline wherever possible. Eleven participants were interviewed and received a supermarket voucher (valued at $30.00) as a koha in recognition of their time and contribution to the project. The interviews were recorded and transcribed verbatim. The transcripts were sent to participants for member checking before they were analysed.

Research Procedures

Survey data was anonymised by a research assistant prior to being provided to the research team for descriptive statistical analysis to provide frequency tables and medians and means as appropriate. Demographic information (participants age, ethnicity, gender, and geographical location at the time of undertaking their study) was collated and to avoid the possibility of identification, data was aggregated where small numbers would otherwise risk disclosure of identity. Interview participants were asked to choose a pseudonym to maintain their confidentiality.

Interview transcripts were analysed using the 6-phase process described by Braun and Clarke (2022). The initial phases were conducted by the research assistant who read all the transcripts to become familiar with the data set, and then systematically identifying specific and detailed codes to capture the meanings of participants. Using an Excel spreadsheet the codes and specific quotes were collated, and these were discussed at length with the researchers, discussing the initial ideas and themes that were subsequently identified. While this useful and active process generated shared understanding of the data, these initial themes or concepts focused on concepts that were explicit or semantic. At this point the first author, an experienced qualitative researcher, revisited the data set to review the themes to look for meaning patterns and core concepts implicit in the initial codes. These revised

themes were shared with the research team, who collaboratively refined, defined and renamed the themes, identifying te reo names for each theme and agreed the order for the presentation of the themes.

FINDINGS

Survey Findings

Demographic data for the 50 survey respondents is presented in Table 2. Considering the invitations were sent to email addresses that were up to 7 years old, the almost 30% response rate was higher than expected and includes a variety of supervision arrangements. 10 survey participants did not provide their age, of the remaining 40 the mean age was 50 years ranging from 28yrs to 74 yrs. For 6 Māori participants the mean age was 53 years. The majority (94%) had more than half of their time in supervision conducted using online mechanisms. A few (6%) had a combination of face-to-face meetings and asynchronous online communications with their supervisors. Most respondents (80%) worked with two supervisors during their candidature, and for most (72%), the same supervisor/s remained involved throughout.

Table 2. Survey Participants' Demographic Characteristics

Characteristic		**All respondents n (%)**	**Māori respondents only n=8**
Gender (n=50)	Female	35 *(70)*	5 *(63)*
	Male	15 *(30)*	3 *(37)*
	Another gender	0 *(0)*	0 *(0)*
Ethnicity (n=50)	NZ Māori	8 *(16)*	
	NZ European	33 *(66)*	
	Pacific peoples*	2 *(4)*	
	Chinese	0 *(0)*	
	Indian	0 *(0)*	
	Other	7 *(14)*	
Dependents in household during study? (n=50)		YES 25 *(50)* NO 25 *(50)*	YES 5 *(63)* NO 3 *(37)*
Number of dependents (n=24)		Range 1-4	Range 1-2 (n=4)
Age of dependents (n=25)	Pre - or primary school age	7 *(28)*	1 *(25)*
	High school/college age	11 *(44)*	3 *(75)*
	Mix of both / adult dependents	7 *(28)*	
Geographical location (n=50)	Ōtepōti/Dunedin**	9 *(18)*	0 *(0)*
	Urban locations outside Ōtepōti/Dunedin**	33 *(66)*	6 *(75)*
	Rural locations outside Ōtepōti/Dunedin	7 *(14)*	2 *(25)*

Table notes:
*Individual ethnicity data for Pacific peoples has been aggregated to minimise the risk of identification.
** Ōtepōti/Dunedin is the city where the institution is physically located

In this paper summary data of the survey data is presented to provide a context for the interview data, and a full report of the descriptive statistics from the survey data is to be reported elsewhere.

Benefits of Distance Supervision

Although a small number of respondents stated that distance supervision did not suit them better than kanohi ki te kanohi (face-to-face), or felt that it made no difference, many respondents indicated that distance supervision was beneficial for them and for some had influenced their choice of master's programme. Distance supervision increased accessibility, whether participants were geographically distanced from the campus, or local. When asked about the advantages of distance supervision, participants identified that online supervision was time efficient and financially less burdensome, and that supervision times could be negotiated and varied to suit their schedules. Supervisor flexibility was appreciated; participants were encouraged to contact supervisors by email and or set up additional meetings.

Online supervision allowed for supervisors and learners from different locations to work together with the student and also enabled easy sharing of documents. For some being online meant that supervision/mentoring sessions were perceived as more informal., as they were in their own home or a similar safe space, rather than in the supervisor's office or classroom.

Several respondents noted the close, caring and personal relationship with supervisors, and considered that their mentors were the right 'fit' for them. Respondents also valued the expertise and experience of the supervisors/mentors. In relation to perceptions of cultural support, two respondents noted that they specifically asked for a Māori supervisor/mentor and saw this person as a much-needed support during their studies. Two other respondents identified that cultural support was available through their whanau (family) and therefore it was the academic support from the supervisors that they required.

Interview Findings

Eleven interviews were conducted with nine wāhine (women) and two tāne (men), with a mean age of 56 years (age range 42-73). There were a mix of ethnicities including two participants who were Māori, nine New Zealand European, and one person who identified as French, with some participants identifying with more than one ethnicity. Interviews provided a diverse range of opinions and experiences, with three broad themes emerging from the thematic analysis. The themes Tūhononga (connection), noho rangapū (collaboration) and whakatutuki (completion) and subthemes are presented in Table 3. The descriptions of each theme with subthemes underlined and supported by direct quotes from the participants is provided below.

Table 3. Themes.

Theme	Subthemes
Tūhononga (Connection)	Regular communication Trusting and open relationship Shared passion Supervisors' enthusiasm Professional alignment Lack of connection Own networks
Noho Rangapū (Collaboration)	A team effort Involvement of mentors Everyone brought something Supervisors from another discipline Different and complimentary roles

Whakatutuki (Completion)	Flexibility Autonomy Development as students Improved academic writing Keeping on track

Tūhononga (Connection)

The theme of tūhononga highlights the importance of relationship building and whakawhanaungatanga (the process of establishing relationships) between the supervisors and the ākonga. The interviews provided many examples of the participants' experiences of developing trusting relationships and meaningful connections, that were both professional and recognised the personal situations of students. When tūhononga was missing the supervisory experience was impacted.

Tūhononga was established through **regular communication** affording the opportunity to get to know each other:

> *I felt like we had quite a lot of contact really early in the piece, like lots of online Hui where we did a huge amount of talking about kind of where we'd both come from as professionals, but we got to know each other as people.* (Kelly)

The establishment of **trusting and open relationships** gave the student confidence to engage actively in the supervisory process: "*I felt like I could just really trust my mentor and not be judged and that we just had a really good deep working relationship and personal relationship, but that I could bring anything to her*" (Gen).

The nature of the supervisory relationship was critical to engagement for one participant who stated, "*if it's [the supervisory relationship] transactional, it's never gonna work no matter what process you put in place. If it's, if it's relational., then you will make the best of what you have*" (Korina).

For some participants tūhononga with their mentors/supervisors grew out of **shared passion** for the topic, and for the direction that the study was taking. "*Our connection came because of the topic – we both had similar interests. I was aware, having done this when I was a little older, that it was important to find someone who I could work with*" (Tania).

Some participants discussed the benefit of having a mentor that was **professionally aligned** with them, and that this facilitated a greater depth of understanding. Supervisors from the same discipline shared their professional knowledge, networks and provided professional support, which enabled students "*to go deeper and they know what resources are out there*" (Carleen).

Alternatively, some participants recognised a **lack of connection** with online hui, and they negotiated or engineered opportunities to meet face-to-face to build whanaungatanga. Nola stated: "*it was my choice to travel to see them because I wanted to size them up. You can't necessarily do that through a screen. You know, I wanted to see whether they were tika, they were true to their word*" (Nola). This participant continued "*once you've got that initial connection [from meeting face to face] then online would be better*". For these participants, meeting face to face helped to cement the relationship, "*because you do miss 80% of the connection of things through online stuff*" (Bryce).

However, an online meeting with other students was particularly challenging for one Māori participant who was not used to working online and felt that the context or cultural underpinnings of the study were not understood.

> *It was difficult for me because I've never done online work before and most of the people in the room were already academics, so they already had that background. I felt like a lot of them didn't know or understand kaupapa Māori research and it wasn't validated and they didn't really understand.* (Korina)

In the absence of tūhononga with mentors/supervisors Korina looked outside of the mentoring relationships, to their **own networks** for the support that was needed: "*these new concepts were groundbreaking. It wasn't a hard place for me to be because I knew that I had my people on the side…that could help me articulate it*". A similar experience was shared by Carleen, despite having face to face meetings: "*I never really felt like I ended up connecting with her. We did a lot of our contact via email, but also met on campus too*". The value of connections was endorsed, by both those who felt they had established a good relationship and those who had not.

Noho Rangapū (Collaboration)

The second theme of noho rangapū which translates to partnership and conveys a sense of collaboration, illuminates the perception that the study was a collective effort between the student and mentors. Participants recognised the importance of **working** together with their mentors/supervisors as a team: "*they were there behind me, believing, that was really important*" (Samantha). There was a clear recognition that a master's research study is both an individual and autonomous piece of work, and a team effort with the mentors/supervisors and with others working for and with the student: "*There was a lot of support and people pulling, you know, pulling strings to get me where I needed to be*" (Samantha). Over the course of the study, the relationship might require more or less **involvement from mentors**, with one participant appreciating the multiple roles and responsibilities that each person in the team plays: "*I think appreciating time, that both parties have time when life gets busy and you know you've got to give each other breathing space*" (Tania).

Having more than one supervisor provided different skills and perspectives on the study. Many participants discussed the value that each supervisor brought to the collaboration. One participant indicated that the relationships were strengthened when **everyone brought something** to the team: "*if they didn't have anything to bring to the relationship it wouldn't work. There would be a power imbalance*" (Rex). This aspect of collaboration was most frequently discussed in relation to having supervisors that were not professionally aligned with the students' study. Many participants recognised the value of having a **supervisor from a different discipline**.

> *it was fantastic to have somebody that wasn't pigeonholed in my discipline because it brings different perspectives. Having someone who's from a parallel profession, and who connections with the things that you're talking about. It offered a different perspective and a different way of looking things … viewpoints from different sectors into your sector.* (Samantha)

As one participant stated that she wanted a supervisor from a different profession because "*you get challenged around your question*" (Tania), while another said, "*My supervisors would question me to get their understanding, which was a real advantage*" (Carleen).

Participants recognised that different supervisors played **different and complementary roles** in their education: "*I think one supervisor could understand what I was trying to do and gave me some ideas about the investigation. The other supervisor provided information when I was doing interviews and the process for that*" (Bryce)

Participants shared that sometimes the role of the supervisors /mentors would be to bring fresh ideas, and at other times to help with practical strategies: "*He gave me lots and lots of ideas, he was really skilled in creating different strategies to do the work*". And similarly:

> *I think* [my supervisor] *challenged my thinking, so giving me things to think about. Not telling me what to think, but helping me to rethink what I was thinking was the approach that I was taking to something … the ability for me to be able to ask questions or that sort of thing*. (Samantha)

For one participant, the supervisor's advice to "*to stay connected*" (Kelly) with the study even when life got in the way, kept her moving forwards. While this sense of collaboration may not be exclusively related to online supervision, it is clear for the findings of this study that working online does not detract from the sense of collaborative effort and may enhance the sense of power-sharing between students and supervisors.

Whakatutuki (Completion)

Participants provided a range of distance/online supervision factors that enabled and motivated them towards successful completion of their qualification. The **flexibility** of online supervision/mentoring was a key factor, as noted in the survey results. The interviews provided greater understanding of how the online supervision impacted on graduates' experiences: "*Benefits of doing it online was flexibility, and in my own time in my own space. It adds a whole lot more flexibility and probably as a result, more time efficient as well*" (Samantha).

For some participants online mentorship that made enrolment in a master's programme possible, being able to study without disrupting their living and working arrangements in order to gain the qualification. "*One of the main motivations for taking on the [master's programme] was that I could do it online abroad*" (Bryce). One participant noted that the flexibility of online "*changed depending on where I was at and what support*..." (Samantha). For many participants online supervision was more time efficient, as there was no need to travel or to move from their own working space for supervision.

Participants shared that being able to talk with their supervisors in their own space, with full access to their documents and papers, gave them a greater sense of **autonomy**, which they believed would not have happened if they had met with supervisors on campus in the supervisor's/mentor's office. The impact of meeting on campus, typically in an office complete with the embellishments of a successful academic might heighten a sense of hierarchy and powerlessness for professional students that the online environment diminishes.

Not surprisingly participants identified that the commitment of their mentors/supervisors was an important contributor at all stages of their student journey, and to their successful completion. They appreciated the mentors'/supervisors' support for their **development as students** from the start the master's journey, through to the end. Participants described how their online supervision encouraged the process of reflecting, researching and refining their study, and how their mentors/supervisors

helped them to review and revise their initial ideas, to get started. Online mentoring and supervision provided opportunities for supervisors to "*sense check*" (Samantha) their work and ideas.

Similarly online mentoring provided opportunities to **improve academic writing**, with participants appreciating how their mentors/supervisors helped them to with language and writing skills, "*to revise … and suggest ways in which publications and presentations could be better*" (Rex) and sent back scripts with "*all sorts of comments on it*" (Tania). Participants felt that mentors /supervisors kept them on track and enabled them to reach completion. One participant felt that being given timelines was helpful, while others identified needing to take time off from study when "*life happens*" (Kelly). Outside of the online mentoring and supervision meetings, emails and documents were shared and responded to, which helped to keep students on track: "*I need somebody who will answer my emails when I'm panicking because I don't know what to do*" (Nola). Having clear schedules, checkpoints, feedback and "*getting all those tasks knocked off*" (Gen) ultimately enabled them to achieve their qualifications.

Together these three themes, tūhononga (connection), noho rangapū (collaboration) and whakatutuki (completion), present a clear picture of the participants' experience of supervision at a distance, with a particular focus on online supervision meetings. It is evident that the supervisory experiences were relationship based and were not dependent on the face-to-face meetings, rather the shared interest, passion for the topic and the ongoing support within the supervisory relationship, shaped their entire study experience.

DISCUSSION

The study set out to discover the factors that enable successful master's completion when supervision is online and explore aspects of online mentorship/supervision that ākonga find helpful to motivate progress. The findings of the survey and the interviews confirm previous research in terms of the benefits of distance supervision including flexibility, accessibility and convenience. While for many in this study the opportunity for online meetings was seen as an advantage, this was not true for all, with some respondents believing that it made no difference whether meetings were in person or online. There was consistency of findings across the two phases of the study, however the interview provided more in-depth and nuanced understanding of the participants experience and perceptions of distance supervision. The study findings suggest that supervisor flexibility and accessibility is perceived as positive to ākonga regardless of the means of communication, and is dependent on effective and direct communication channels, whether in person, online, or by email, with the supervisor when needed.

The themes or central concepts arising from the interview data provide greater insights into factors that support students in their master's study and motivate progress towards successful completion. The supervisory experience should therefore be considered as an integrated whole, where tūhononga (connection), noho rangapū (collaboration) and whakatutuki (completion) are the affordances of a learning space that is created through online supervision. The relationship developed between the ākonga and supervisors affords an opportunity and environment for collaboration and responsive pedagogies in which progress at each stage of the learning journey is fostered (Brown et al., 2022). The implication of this study centres on the recognition that tūhononga, noho rangapū, and whakatutuki are not three separate factors in distance supervision but rather they are facets of an integrated whole.

Other authors have identified that the relationship between the supervisor and supervisee is integral to completion. Brownlow et al. (2023) for example, proposes that a relationship that offers choice

rather than control is a predictor of completion. Such relationships support student autonomy and enhance motivation, whilst demonstrating care and kindness, a sense of belonging and providing relevant structure and training (Brownlow et al., 2023, pp. 1617-1618). The findings of this current study confirm the importance of the relationship as a collaboration, and emphasises equity over autonomy, to create a sense of partnership between supervisor and supervisee, working to create the space in which completion will occur. The importance of collaboration in post graduate supervision has also been recognised in supporting students with disabilities and importantly in eliminating barriers to successful completion (Manase & Ngubane 2024, p. 379).

Aitkin et al. (2022) found that strong supervisory relationship can be achieved through online supervision. Proposing a model of participatory alignment in the student supervisor relationship, these authors stressed that the optimal relationship should not be too close or too distant, and concluded that over alignment, i.e. becoming too familiar, may lead to lack of criticality. Conversely, the current study found no indication that supervisory relationships were experienced as being too close. The study suggests that creating tūhononga, at the start of the relationship was a key factor leading to success.

In the context of Aotearoa New Zealand, tikanga (Māori cultural practice) is embedded within education, and supports the importance of whanaungatanga (relationship building), as a foundation for working together. The word whanaungatanga includes the word whanau meaning family or kinship, suggesting that relationship building includes a sense of belonging and shared values (Rātima et al., 2022). Whanaungatanga begins with formal introductions before working together, and continues throughout the supervisory relationship to ensure tūhononga is maintained (Rātima et al., 2022). Knowing and understanding each other through whanaungatanga is critical to respectful and mutually beneficial relationships, builds a strong sense of collaboration, and culturally responsive pedagogies (Brown et al., 2022). From this perspective the idea that tūhononga between supervisor and ākonga could be too close does not have any basis.

Veles and Danahar (2022) propose another level of collaboration in research supervision which transcends the binary division of self and other such as master/apprentice or mentor/protégé, as previously described by Macfarlane (2017). This new level is characterised by equal partnership, co-creativity and reciprocal learning based on a 'recombination of each of the contributing actors' knowledge, expertise and experience into something novel, unique and previously undefined' (Veles & Danahar, 2022 p. 12). This reciprocity in student supervision is conceptualised as a third space which achieves benefits for both as equal partners "providing mutual enrichment and learning from each other, without any one party holding assumptions of the superiority of knowledge claims" (Veles & Danahar, 2022, p. 13).

Whitchurch (2008, 2012) uses *Third Space* to describe the new ways in which academic and professional (administration and support services) staff work together in higher education, transcending the professional boundaries and organisational structure to contribute to change through collaborations. Importantly the third space provides a site for diverse thinking and generation of new professional identities and perspectives (Veles & Danaher, 2022). This study found that positive supervisory experiences were afforded by tūhononga (connection), noho rangapū (collaboration) and whakatutuki (completion), working in partnerships, rather than binaries of superior and inferior, student and supervisor. Supporting the Māori cultural understanding of Ako as reciprocal learning, these experiences provide a creative space of co-constructed knowledges and new identities.

It would be presumptuous to conclude that the (arguably) ideal of reciprocity and co-constructed knowledges is an outcome of distance supervision per se, specifically as the study did not include the perspectives of supervisors, however the study findings based entirely on students perspectives provide strong indications that the collaborative relationship between mentors/supervisors and the student created a pedagogical space in which they were able to achieve success. Further research is needed to explore the supervisors' perspectives of the supervisory relationship, and its benefits in terms of both academic and personal enhancement.

In addition, the concept of reciprocity within the supervisory relationships may not be confined to distance supervision and could be equally important in supervisory relationships that are primarily co-located and face to face. Again, this was not explored in the current study, and is worthy of further investigation and comparison. What this study has added to previously identified benefits of online supervision are the perspectives that relationships between supervisor and supervisee are not hierarchical or horizontal., in fact they are not linear at all, rather effective master's supervisory experiences take place in an integrated learning space that affords connection, collaboration and completion at every stage of the students' progress.

Study Limitations

The study was conducted in one institution in in Aotearoa New Zealand and therefore the findings may not be applicable to other organisations, or other countries and cultures. A further limitation of this study was that participants in this study were all graduates and those that did not complete their studies were not included. The initial survey response rate at almost 30% was positive, however it is likely to be a biased participant group, that those that responded probably had more positive regard for the institution and distance supervision than those that did not.

Some participants in the study were supported fully by distance supervision, while some had some face-to-face supervision as well. However, the diversity of supervisory experience allowed for some comparison between online and face-to-face supervision. Nine of the eleven interview participants identified as European ethnicity with only two identified as Māori. Finally, as some participants were recalling their experience of supervision from seven or more years previous, recall bias may also be a factor.

CONCLUSION

Distance supervision at master's level is an increasingly popular choice for increasingly diverse ākonga in New Zealand and utilises a diverse range of synchronous and asynchronous technology. This study explored the experience of distance supervision from the perspectives of graduates from one institution in Aotearoa New Zealand. The study participants were mostly mature professionals, studying part-time, and therefore benefitted from greater flexibility and accessibility afforded by distance supervision. While many traits are likely common to face to face supervision and distance, there are some aspects better catered for by distance supervision, specifically the development of collaborative relationships based on mutual respect and trust. Importantly distance supervision does not seem to disadvantage ākonga.

The significance of this study is its focus on the supervisory relationship between ākonga and supervisor, and the interplay between tūhononga (connection), noho rangapū (collaboration), and whakatutuki (completion), to support students in master's study. The importance of whanaungatanga

at the start, and continuing throughout the master's journey, is recognised, as a culturally responsive pedagogy in master's supervision at a distance. Successful supervisory relationships, from the perception of ākonga, are collaborative and permit the sharing of knowledges, reflection and the development of new thinking. Shared passion in the topic and a commitment to teamwork were important factors to student completion. The findings suggest that the development of an open and trusting supervisory relationship is key to successful completion and can be achieved at distance.

GLOSSARY

Te Reo Māori	**Meaning (from Te Aka Māori Dictionary)**
Ako	to learn, study, instruct, teach, advise
Ākonga	Student, Pupil, learner, Protégé
Hui	Meeting
Kaiako	Teacher or instructor
Kanohi ki te kanohi	Face-to-face
Kaupapa Māori	Māori approach, Māori ideology - a philosophical doctrine, incorporating the knowledge, skills, attitudes and values of Māori society.
Koha	Gift, present, offering, donation, contribution
Noho rangapū	Collaboration or Partnership
Tāne	Men
Taonga	Treasure, socially or culturally valuable objects, resources, phenomenon, ideas and techniques.
Te reo	Māori language
Te Tiriti o Waitangi	Māori text or version of the Treaty of Waitangi signed in 1840
Tūhononga	Connection or Cluster
Wāhine	Women
Whakatutuki	Achievement, completion, attainment, realisation.
Whakawhanaungatanga	Process of establishing relationships, relating well to others.
Whanau	Family, family group, not necessarily kinship ties,
Whanaungatanga	Relationship, kinship, sense of family connection

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Artificial Intelligence in Sustainable Teacher Education: Readiness and Perspectives of Pre-Service Teachers in Open Distance Learning

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ABSTRACT

Artificial intelligence (AI) holds transformative potential for teacher education, especially within open distance learning (ODL) in the Global South. This exploratory study investigated the readiness and perspectives of first-year pre-service teachers regarding technology integration, with specific reference to AI, in their educational practices as students and future teachers. UNESCO's AI Competency Framework for Teachers was used to frame this single case study. Within an interpretative paradigm, the study adopted a qualitative approach. Data were generated at an ODL institution in South Africa through open-ended questionnaires completed by 197 Bachelor of Education students. Deductive thematic analysis was used to analyse the data. The findings from the five themes revealed varying levels of readiness, shaped by disparities in access, confidence, and familiarity with AI tools. Many participants lacked foundational skills and called for structured training and ongoing professional development to build competencies in ethical, pedagogical and practical use of AI. The study concludes that effective integration of AI into sustainable teacher education must be inclusive and context-responsive, especially in under-resourced ODL environments. Limitations include a single case study with one instrument and self-reported data, which calls for follow-up research. The paper contributes valuable insights into how teacher education programmes can prepare future teachers to use AI responsibly and effectively in support of inclusive and quality education for all.

Keywords

artificial intelligence; educational technologies; pre-service teachers; open distance learning; UNESCO AI framework for teachers; teacher readiness; sustainable teacher education; global South; equitable access; ethical use

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INTRODUCTION

The growing relevance of artificial intelligence (AI) in education has gained considerable attention across the globe as it has transformative potential to enhance teaching and learning. Within seconds, AI can comprehend and generate new content by accessing vast amounts of data, far surpassing any human's capacity (Bozkurt, 2023). Emerging practices in the use of AI in education clearly demonstrate its potential to make new forms of teaching and learning possible, support teachers in their tasks and enhance students' learning experiences (UNESCO, 2024). Countries worldwide have invested in AI to modernise their educational systems. For example, China actively promotes the integration of AI into classrooms and teacher training to improve student outcomes, while the United States has developed AI-empowered personalised learning platforms designed to reduce educational inequalities and meet diverse students' needs (Li, 2024). The use of AI in teaching and learning, therefore, has significant implications for both teachers' roles and the competencies they need. However, there are also considerable risks associated with AI that affect teachers, education systems, and society as a whole. These challenges include ethical concerns, potential undermining of human agency, violations of data privacy, exacerbation of existing systemic inequalities and exclusions, and an increase in the digital divide (George & Wooden, 2023; Mwansa et al., 2025). The risk of deepening systemic inequalities and exclusion is particularly relevant in the ODL environment due to its heavy reliance on digital tools for teaching and learning.

In the context of ODL in South Africa, which is the context of this paper, AI can play a significant role in enhancing the quality of education using technologies such as adaptive learning and assessment systems (Opesemowo & Adekomaya, 2024). However, the increasing reliance on educational tools can widen the digital divide, with underserved communities often lacking the needed infrastructure to fully benefit from AI-enhanced learning experiences (Sadiki et al., 2023). For this reason, while the integration of AI holds promise for transforming teacher education, a cautious and inclusive approach is needed to ensure that it bridges rather than widens the gaps in educational equity and accessibility. Sustainable teacher education in ODL is crucial, given the need to continuously adapt to evolving educational landscapes in the context of AI integration. Importantly, teachers must receive adequate training and develop the necessary competencies to integrate AI effectively into pedagogical practices. In this regard, Yunina (2023) emphasises the need to integrate AI with pedagogical frameworks to mitigate risks associated with misinformation and lack of accountability arising from reliance on technology.

This research centred around the lack of empirical data regarding the readiness of pre-service teachers to use AI in ODL contexts. Despite the increasing acknowledgement of AI's potential to revolutionise personalised learning and instructional planning, there is a significant gap in understanding how prepared future teachers are to integrate these technologies into their practices. Existing studies have shown the correlation between familiarity with AI tools and pre-service teachers' confidence and willingness to use technologies in their decision-making processes (Merzifonluoglu & Gunes, 2025). However, studies do not specifically focus on ODL environments, where the application of AI significantly influences teaching and learning. This lack of targeted research limits our insights into best practices for preparing teachers to use AI effectively in distance education, ultimately risking the successful implementation of these transformative tools. Addressing this gap is necessary to inform teacher education programmes and ensure that pre-service teachers are adequately equipped to use

AI tools in their future careers (Hoya et al., 2024). To address this gap, the study addressed the following research question:

> *What are the levels of readiness and perspectives of pre-service teachers in ODL regarding the integration of AI into sustainable teacher education?*

LITERATURE REVIEW

Sustainable Teacher Education and Its Digital Transformation

Sustainable teacher education takes a holistic approach, providing teachers with essential knowledge and skills while integrating principles of sustainability into education systems. In today's era of digital transformation, sustainable teacher education is crucial for achieving Sustainable Development Goal 4 (SDG4), which emphasises the importance of inclusive, equitable and quality education for all (Baskara, 2024). In the context of ODL, particularly in the Global South, this transformation involves the preparation of future teachers to use emerging technologies that enhance learning, promote equitable quality education for all, and address systemic inequalities (Zawacki-Richter et al., 2019). However, as Siddiqi (2024) mentions, these technologies must be guided by a commitment to sustainability, inclusivity, and ethics, particularly in areas marked by infrastructure disparities and unequal access to digital resources.

The Role and Potential of AI In Teacher Education

To improve educational practices globally, the role and potential of AI in teacher education are increasingly gaining recognition. AI tools have the capacity to enhance teaching, with new applications emerging almost daily. These tools aim to enrich instructional practices, support teachers, and personalise learning experiences for students. For example, adaptive learning platforms and intelligent assessment systems offer teachers the ability to personalise instructions according to individual students' needs while providing real-time feedback. Tools such as Socrative and Kahoot! can be used to create interactive quizzes that adjust difficulty based on student performance (Arruda & Arruda, 2024), while Duolingo uses AI algorithms to personalise language learning by adapting content based on students' language proficiency (Yunina, 2023). Furthermore, tools such as ChatGPT, Deepseek and Copilot can create dynamic and interactive learning content, assist with lesson planning, and provide feedback, enhancing critical thinking and student engagement (Van den Berg & Du Plessis, 2023; Kohnke & Zou, 2025). Moreover, AI plagiarism checkers can assist teachers in maintaining academic integrity while providing students with constructive feedback on their work (Ibrahim, 2024). These examples highlight the progressive integration of AI, aligning with global efforts to promote sustainable development and quality education for all as outlined in SDG 4.

The Ethical Use of AI In Teacher Education

As AI technology integrates more deeply into educational environments, its ethical use in teacher education is a growing concern. Teacher education programmes must equip pre-service teachers with the knowledge and critical awareness to navigate AI's ethical implications. A primary concern is academic integrity, as AI-driven tools can promote dishonest practices such as plagiarism. Research indicates that many students lack adequate guidance on how to use AI, leading to debates about its responsible use in educational settings (Pan, 2024). Furthermore, the reliance on AI can increase inequalities if tools are biased towards specific data or lack representation of diverse student populations, resulting in educational outcomes that negatively impact marginalised groups (Song &

Ko, 2024). Another ethical concern is data privacy, as sensitive information about teachers and students can be collected, stored and processed without the needed consent or transparency (Sanusi & Olaleye, 2022). In the use of AI, teachers need to stay in control of their own pedagogical approaches to ensure that they or their students do not become overdependent on technology. As highlighted by Morandín-Ahuerma (2024), ethical AI implementation in educational contexts emphasises the need to retain human agency, ensuring that technology complements rather than replaces human insight in educational processes. In practical terms, this means that AI tools should be used to support dynamic and adaptive learning environments while upholding the core principles that support effective education. By integrating ethical training into teacher education programmes, teachers can develop the needed competencies to navigate the complexities of AI responsibly, creating an ethical and equitable educational landscape (Lepri et al., 2021).

AI Readiness and Competencies of Pre-Service Teachers

Preparing pre-service teachers for AI integration in education is essential for effective and responsible use of emerging technologies. Readiness includes not only technical skills, such as using AI tools for lesson planning, assessment, and content creation, but also pedagogical and ethical competencies that support meaningful classroom application. Studies show that pre-service teachers with higher levels of digital literacy and exposure to AI tools were more confident and open to using such tools in their future teaching (Karina & Kastuhandani, 2024; Merzifonluoglu & Gunes, 2025). The UNESCO AI Competency Framework for Teachers identifies areas for development, including understanding AI applications, ethical awareness, and the ability to develop digital literacy among learners. Nevertheless, in many contexts, specifically in ODL, there remains a significant gap in structured training for teachers and curriculum support to effectively develop AI competencies (Bekdemir, 2024). Equipping future teachers with these competencies is essential not only for their professional growth but also for ensuring that AI serves as a tool for inclusive, equitable and context-sensitive education.

Theoretical Framework

Due to the lack of clearly defined competencies and training programmes for preparing teachers with the ethical, effective and human-centred integration of AI in education, UNESCO has developed an AI competency framework for teachers (UNESCO, 2024). Its purpose is to guide national AI competency frameworks and inform teacher training. The goal is to enhance teachers' understanding of AI, apply ethical principles, and support their professional development. This framework, according to UNESCO (2024), is the first global framework of its kind and is deemed suitable to support this study, which focuses on pre-service teachers' perspectives and readiness to integrate AI in their teaching and learning.

The framework addresses the growing need for equipping teachers with the competencies necessary to navigate meaningfully with AI in educational settings. It outlines five interrelated progressive competency aspects that together support comprehensive teacher readiness. Central to the framework is a human-centred mindset, which highlights the values and attitudes that enable responsible and empathetic human-AI interactions. Closely linked to this is the emphasis on the ethics of AI, which encourages teachers to understand and apply ethical principles, laws, and regulations governing AI use in education. The AI foundations and applications aspect focuses on the conceptual and practical knowledge teachers need to have to use AI tools effectively in their teaching contexts. Building on this, AI pedagogy addresses the instructional competencies teachers need to thoughtfully

and purposefully integrate AI in their teaching practices. Finally, the framework includes AI for professional development, which refers to the competencies teachers need to have to use AI in their lifelong professional learning. Together, these aspects form a cohesive foundation for fostering confident, ethical, and pedagogically sound engagement with AI in education.

Although the framework has three progression levels, as shown in Table 1 below, this paper will only focus on the "acquire" level. The participants in this study were first-year pre-service teachers, and it is assumed that these teachers will progress into the more advanced levels of "deepen" and "create" in their future careers.

Table 1. The UNESCO competency framework for teachers' aspects and progression levels (UNESCO, 2024)

Aspects	Progression		
	Acquire	Deepen	Create
1. Human-centred mindset	Human agency	Human accountability	Social responsibility
2. Ethics of AI	Ethical principles	Safe and responsible use	Co-creating ethical rules
3. AI foundations and applications	Basic AI techniques and applications	Application skills	Creating with AI
4. AI pedagogy	AI-assisted teaching	AI–pedagogy integration	AI-enhanced pedagogical transformation
5. AI for professional development	AI enabling lifelong professional learning	AI to enhance organizational learning	AI to support professional transformation

The framework was found applicable to support this study, which sought to determine AI readiness and perspectives of pre-service teachers in ODL. Given that many pre-service teachers are being trained in ODL environments, it is essential to understand their readiness for AI integration through a lens that reflects the distinct pedagogical, technological, and ethical demands of this mode of learning. The framework provides a comprehensive structure for evaluating not only their technical knowledge but also their pedagogical competencies, ethical awareness and attitudes towards AI. Moreover, it serves as a valuable guide for identifying areas where targeted training and professional development are needed.

RESEARCH METHODOLOGY

Within an ODL context, this study used a qualitative single case study design to generate data for the empirical study. An interpretive paradigm was employed to examine future teachers' readiness to adopt AI, along with their perceptions of the necessary competencies and use of AI. The population consisted of all first-year Bachelor of Education students at a South African ODL institution. A total of 424 students enrolled in a curriculum studies module received an invitation to participate in a study using an open-ended online questionnaire. Of these, 197 students responded, forming a purposive and convenience sample. Among the participants, 100 were registered for the Senior and Further Education and Training phase (Teaching Grades 7-12), and 97 were enrolled in the Intermediate phase (Teaching Grades 4-6). The sample included 125 female and 68 male participants, while four chose not to disclose their gender.

Of the total participants, 94 reported living in rural areas, while 103 resided in urban or semi-urban settings. This distinction is particularly relevant in a developing country like South Africa, where disparities in access to digital infrastructure remain a significant barrier. These geographical and socio-economic differences, combined with varying levels of digital confidence and acceptance of AI, emphasise the need to better understand the skills development and support needs of pre-service teachers as they engage with emerging technologies.

The questionnaire was designed after reviewing existing literature and was refined with input from three faculty members with experience in AI integration in education. The final version, which took approximately 20 minutes to complete, was distributed online. To address the aim of the study, students answered four open-ended questions that explored their perspectives on their AI-related skills and needs for related training and support.

Guided by the theoretical framework, thematic analysis was used to identify, analyse, and report patterns from the qualitative data sets. The process followed Braun and Clarke's (2019) six-phase approach: familiarisation with the data, generating initial codes, searching for themes, reviewing themes, defining and naming them, and producing the final report. To verify the themes, the Galaxy.ai thematic analysis generator was used as an AI-assisted tool, and Grammarly supported the final editing and clarity of the findings.

Ethical clearance for the study was obtained, and participants were fully informed about its purpose, the voluntary nature of their participation, and the steps taken to ensure anonymity. To ensure confidentiality in reporting the findings, each pre-service teacher was assigned a numerical identifier (PTP 1 – PTP 197).

FINDINGS AND DISCUSSION

The questionnaire had a number of closed-ended questions, mostly to provide the context and background for the study. Four of these responses are worth sharing as they are closely related to the open-ended responses discussed in the paper.

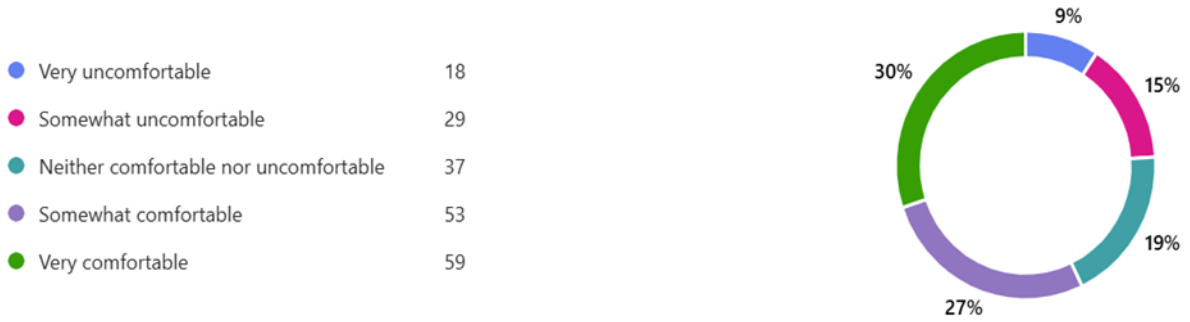
The first question asked if participants had regular access to a device (e.g. a laptop or a mobile phone) for their work and studies. Their responses:



The second question asked if they had reliable internet access. Their responses:



The next question asked about their comfort level with using technology in their educational practices. Their responses:



Another question asked about their familiarity with AI tools (such as ChatGPT, Grammarly and Copilot and others). Their responses:



The above responses offer valuable contextual insights into students' lived experiences, revealing several critical barriers to inclusion in the ODL environment. For example, the first question shows that 11 out of the 197 participants still did not have regular access to a personal device, probably showing reliance on a shared or borrowed device. Such dependence compromises both accessibility and continuity of learning. In addition, 51 participants indicated that they did not have reliable internet access, which is an essential requirement for navigating ODL platforms, accessing learning materials, online participation, and assessments.

Even more concerning, 84 participants indicated discomfort with using technology for their educational practices, reflecting gaps in digital literacy. This challenge is deepened by the finding that

63 participants were unfamiliar with AI tools, showing a significant lack of exposure to technologies that are increasingly shaping the educational landscape. These findings are worrying, particularly in the context of ODL, where learning is dependent on consistent access to technology and foundational digital literacy. The absence of access and competencies not only undermines students' ability to engage effectively with online content but also increases existing inequalities in the digital environment. In this sense, the digital divide threatens to undermine the transformative potential of AI and emerging technologies

The data analysis of the open-ended questions was guided by UNESCO's competency framework for teachers, focusing on the "acquire" level relevant to first-year education students. The following interrelated themes emerged and will be discussed next.

- The human-AI relationship
- AI and ethics
- AI knowledge and applications
- AI teaching and learning
- Suggestions for professional development and training

Theme 1: The Human-AI Relationship

This theme reflects participants' perceptions of how AI relates to their identities as students and future teachers. Many participants were positive about the role of AI in their lives and saw the tool as an assistant, particularly giving them confidence when they were unsure if they were on the right track. This is in line with the study of Karina and Kanthamani (2024), which indicates that students who used AI tools became more confident in integrating them into their educational practices. For example, a participant shared that "*AI gives me ideas and simplifies things I struggle with. I feel more confident the more I use it*" (PTP 136), reflecting a sense of partnership between human cognition and technological support. Another noted that "*It helps me to prepare my lessons and even gives me examples I can use in class. But I still feel I must think first before just asking it*" (PTP 107). This response demonstrates an understanding of the human responsibility to use the tool thoughtfully and reflectively, aligning with authors such as Yunina (2023) and Kong et al. (2023), who emphasise human accountability when integrating AI with pedagogical frameworks. In particular, the study of Merzifonluoglu and Gunes (2025) found that pre-service teachers, particularly those who were familiar with AI tools, viewed AI as a supportive advisor that enhanced their confidence and decision-making skills, especially in their lesson planning.

Contrary to the above, others were more cautious about AI's role and raised concerns about AI undermining critical thinking, reducing cognitive autonomy, and potentially replacing human roles in education. A participant stated that "*AI should be seen as a teaching companion, not as a replacement*" (PTP 36), while another mentioned that "*I'm worried about learners, and sometimes teachers, relying on it too much. It can make us lazy and stop us from developing our own thinking*" (PTP 43). The different attitudes towards the role of AI resonate with the human-centred approach indicated in UNESCO's AI competency framework for teachers (UNESCO, 2024), which urges teacher education programmes to focus not only on technical fluency but also on reflective, values-based engagement with AI. AI should be "at the service to strengthen human capacities as well as sustainable development" (UNESCO, 2024, p. 17), emphasising human accountability. These varied responses highlight the dual role of AI as both the enabler of confidence and a disruptor of independent thought,

depending on how it is engaged. This confirms the urgent need for teacher education programmes to promote AI literacy that balances empowerment with ethical and pedagogical awareness

Theme 2: AI and Ethics

The second theme highlights student teachers' awareness of the ethical implications of using AI in academic and professional contexts. Several concerns were raised, and the responses point to the contradiction between AI's role as a facilitator and a disruptor of traditional education. Responses included issues of academic honesty, overdependence, data privacy and equitable access. Many participants voiced ethical concerns around "copy and paste" behaviours and the temptation of letting AI do the work, rather than being a partner. One participant indicated that AI "*destroys*" as it "*leads students to plagiarise*" (PTP 81), while another said that AI won't be beneficial for students, as "*it's a way to plagiarise*" (PTP 169). Students' concerns strongly align with UNESCO's AI competency framework for teachers' third aspect, which focuses on the ethical, safe, and responsible use of AI. The framework emphasises the need for teachers to understand how AI may impact learner autonomy, reinforce inequalities, and present risks such as plagiarism or biased outputs. The framework recommends training to address these ethical dimensions to help build a culture of reflective, responsible and inclusive AI use in education (UNESCO, 2024).

Several participants highlighted how rural or under-resourced students may lack access to AI or smart tools, risking marginalisation. As an example, a participant cautioned that "*Currently, many South African schools are still behind in terms of technological advancement*" (PTP 84). Another said: "*There are learners in rural schools with no laptops or internet. AI benefits some but widens the gap for those who can't access it. That's not fair*" (PTP 90). These reflections expose an urgent equity challenge related to the ethical use of AI: ensuring that access does not become a barrier to opportunity. This concern aligns with the observations of Sadiki et al. (2023), which emphasise that underserved communities may not benefit from AI-learning experiences due to a lack of access. The study of Mwansa et al. (2025) further found that the digital exclusion in rural South Africa is a reality that is further exacerbated by limited infrastructure, unaffordable internet access, and low digital literacy, which significantly hinders equitable participation in AI-supported education. The ethical dimension of AI education, therefore, must extend beyond issues of honesty to include socio-technological justice and responsible universal design to accommodate all (Sam & Olbrich, 2023). In this regard, participants asked for regulation of AI, stating, for example, that "*AI should be regulated. Institutions should offer workshops and make the rules clear*" (PTP 162) and "*Educators must ensure that learners cite properly and don't become overly dependent on AI*" (PTP 90). The research of Mwansa et al. (2025) confirms the findings of this study, as it had a strong call for workshops and institutional rules regarding the use of AI. Regulation, therefore, should include training programmes that explicitly engage with these complexities. It should involve both teachers and students, helping them to understand AI's capabilities, limitations, and ethical implications. This will contribute to a culture of human responsibility and reflective engagement with AI tools.

Theme 3: AI Knowledge And Applications

This theme covers participants' self-reported digital skills, AI literacy and practical usage in their pedagogical practices. In their responses to a question about the skills they have gained when using technology in ODL, they reported various basic as well as advanced skills, such as typing, paraphrasing,

referencing, data literacy, using software applications such as MSWord, PowerPoint and Excel, and navigating AI tools such as ChatGPT, Kahoot! and Quizlet.

Students indicated that they have learned to type their assignments and submit them online. For example, a participant shared that

> *I am now able to type my own assignments using MS Word, and I am able to use a computer to make PDFs and to access information online.* (PTP 30)

This finding reveals that even basic skills, which are often taken for granted in ODL contexts, are in fact significant milestones for some students. Building on the importance of foundational digital skills, several participants pointed to emerging competencies they developed in navigating AI tools. For example, several participants referred to prompting skills they have gained, indicating, for example, that "*Prompting is a skill I didn't know before*" (PTP 153), and that AI taught them to ask the right questions. Bozkurt (2024, 115) reinforces the importance of prompt engineering as an "indispensable component of AI literacy, requiring a robust foundation of both conceptual knowledge and practical skills." This means that teachers must not only develop both technical fluency and metacognitive awareness of how language and framing influence the responses of AI. Students in the current study may not yet grasp how to engineer prompts for deeper learning outcomes of teaching practices, which emphasises the growing need to formally integrate prompt literacy into teacher education programmes, particularly in ODL environments where students heavily rely on technology. Without structured training, pre-service teachers risk remaining surface-level users, unable to fully use the potential of AI in their teaching. With effective prompt engineering, AI tools can be used as a collaborative thinking partner instead of a passive tool.

With reference to knowledge gained, participants indicated that AI assisted them in finding information they didn't understand (PTP 76) or supported them with paraphrasing or summarising information (PTP 110). However, these skills, though promising, point to surface-level interactions with AI rather than deep pedagogical interaction. The responses show early-stage development in the "AI foundations and applications" aspect of UNESCO's framework. In an early study on teachers' perceptions of their AI skills, teachers in the study of Polak et al. (2022) reported similar results. Their study revealed that while teachers acknowledged the growing role of AI in education, particularly in helping students with writing, brainstorming and content creation, they generally lacked a critical understanding of how AI tools function, their embedded biases, or relying on them uncritically. A limited understanding of how AI and its algorithms work, along with its limitations, highlights the necessity for AI literacy training that goes beyond mere tool usage to promote critical understanding and engagement. Without this, pre-service teachers may struggle to move from AI consumers to reflective practitioners capable of mediating AI's role in students' development.

Theme 4: AI Teaching and Learning

This theme focuses on how pre-service teachers saw the use of AI transforming their classroom experiences and supporting diverse learning needs. In their responses, they referred to lesson planning, interactive instruction, digital tools, and flipped classrooms. This theme aligns with the fourth aspect of UNESCO's AI competency framework for teachers, which focuses on using AI to enhance teaching and learning. According to the framework, teachers should be equipped to integrate

AI tools meaningfully into pedagogy, supporting personalised learning, improving engagement, and addressing diverse student needs (UNESCO, 2024).

A number of participants shared that AI assisted them in their lesson planning and presentation, referring to "*lesson plans with visuals and summaries*" (PTP 119), assistance with engaging lessons (PTP 29), improving their English language skills in their future teaching (PTP 3), and saving them time to prepare (PTP 130). These responses show that pre-service teachers view AI and technology as not only technical aids, but also as on-demand pedagogical partners that can support more dynamic, inclusive and learner-centred teaching. These findings are confirmed by Kohnke and Zou (2025), who explored how AI tools such as ChatGPT can enhance English second language teaching and support teacher development. The study found that AI was highly effective in designing lesson plans, generating examples, developing assessments and explaining complex language rules, which were all tailored to student needs. The study of Kohnke and Zou and the current study emphasise the personalised and context-sensitive support AI can offer, particularly when preparing novice teachers for real-life challenges. However, the findings in these studies also stress the need for teachers to understand AI's capabilities as well as its constraints so that its use enhances, and not replaces, professional judgement and learner engagement.

An interesting view was the fact that participants shared that technology assisted in providing informative videos. For example, one indicated access to videos on class management and knowledge that was found to be beneficial to newly appointed teachers. The participant stated:

> *Technology gives me videos and notes on how to deal with [classroom] situations and children. It prepares me for the classroom since these are situations that I will be facing.* (PTP 88).

This comment illustrates how AI-empowered content, like instructional videos, connects theoretical knowledge and practical classroom realities. AI, therefore, is not just a tool for content delivery, but also an informative resource that can help equip future teachers to build the confidence to teach effectively.

Several participants stated that they use technology and AI in a flipped classroom approach to enhance student engagement and preparation. For example, one stated that they require learners to conduct online research to specify topics before the lesson, allowing class time for deeper discussion and clarification (PTP 67). This view demonstrates a practical understanding of how AI can extend learning beyond the classroom and prepare teachers to meet the diverse needs of students. It emphasises a shift towards a more student-centred approach, where AI and digital tools can be used to foster autonomy and critical thinking. Suvendu and Deb (2024) similarly argue that the flipped classroom model, supported by digital tools and AI, creates opportunities for differentiated instruction and greater student autonomy. Their research underlines that using AI tools outside the classroom allows more time in class for dialogue, feedback, and active learning. These findings emphasise that the shift towards the flipped classroom approach requires both access to technology and intentional pedagogical design. For this reason, teacher education programmes have to prepare future teachers to use digital tools as well as integrate them meaningfully into instructional models like flipped classrooms that support active learning and equity.

Theme 5: Suggestions For Professional Development and Training

Based on a question about suggestions and the need for training and professional development for them and others as teachers, this was a strong team with many suggestions from participants. Most students referred to training on how to use AI in different aspects of lesson planning and presentation. The word cloud created from the student responses captures the most frequently mentioned terms, such as AI, students, learning, and technology. This shows the key areas where future teachers saw potential and indicated training needs for integrating digital tools and AI into their teaching practices.

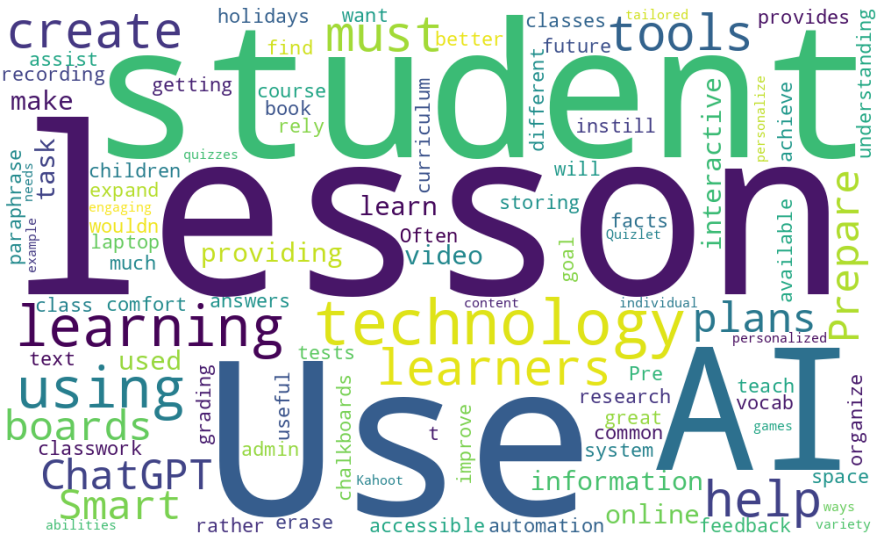


Figure 1. Word cloud showing student suggestions for training on using AI and technology in teaching. (Author's own)

Participants were clear and consistent in their call for structured AI training. Their responses covered a broad spectrum of needs: from learning how to integrate ChatGPT into lesson plans to exploring AI-driven feedback, assessment tools, and even immersive technologies like virtual and augmented reality. Suggestions also reflected a desire for guidance on ethical prompting, originality, learner engagement, and personalised learning approaches. As PTP101 explained, "*Training on how to use ChatGPT and adaptive platforms to personalise learning*", while another (PTP 84) cautioned that "*Technology must not kill originality; we must be trained to keep the balance*".

However, a thread of exclusion and fear also ran through this theme. Several participants admitted that they were not using AI due to a lack of knowledge, fear of misuse, or misinformation about AI's accuracy. For example, a participant said, "*I don't use AI because I don't know how. I hear others talking about ChatGPT but feel left out*" (PTP 39). This reflects the critical professional development need for AI training to build competence as well as confidence, addressing digital marginalisation. This calls for a paradigm shift in teacher education: one that embeds AI not as a technical add-on, but as a core pedagogical competency, coupled with critical awareness and inclusive design. It implies that both confidence and competence need to be addressed through ongoing opportunities that empower future teachers to become agents of ethical AI integration, with specific reference to underserved and rural areas. These findings align with the UNESCO framework, emphasising the role of continuous professional development and contextual adaptation. The framework further highlights the importance of ensuring equity and inclusion, especially for those in disadvantaged contexts. This study shows how misinformation and lack of access contributed to digital exclusion. By using the UNESCO

framework for teachers, teacher education institutions can address these challenges and support all future teachers.

This theme signals a dual challenge for teacher education training institutions, namely, to integrate AI into teacher education programmes and to provide just-in-time learning opportunities that evolve alongside technological advances. In a paper on the urgency of AI integration in teacher training, Bekdemir (2024) echoes the urgency of teacher training. He states that while AI holds significant promise for personalised learning, intelligent tutoring, and adaptive feedback, these benefits may remain largely inaccessible without teacher preparedness and readiness. Bekdemir stresses the value of hands-on workshops, practical examples and ongoing technical and pedagogical institutional support.

IMPLICATIONS

The findings of the study have several implications for advancing AI in the context of sustainable teacher education, especially within ODL institutions in the global South. The study reveals varying levels of AI readiness among pre-service teachers, indicating the need for curricula that integrate foundational AI concepts, ethical reasoning, and pedagogical applications. Structured engagement with the UNESCO AI competency framework for teachers can ensure that future teachers acquire relevant skills to navigate the AI landscape responsibly and ethically.

Aligned with the goals of sustainable teacher education and SDG4, the integration of AI must support inclusive, equitable, quality, and context-sensitive practices. This means moving beyond mere access to fostering critical digital access. From the findings, it also became clear that the ODL context highlights unique challenges related to access to technology and the internet. Therefore, institutions must prioritise equity in AI access and support. Without addressing these systemic disparities, the promise of AI for teacher education may remain unrealised for many students.

Pre-service teachers' perspectives revealed strong concerns about the ethical use of AI. Programmes, therefore, should include ethics training that aligns with sustainable and human-centred educational practices, ensuring that technology complements rather than replaces pedagogical intent.

Lastly, the findings reiterated the need for differentiated and continuous development that addresses diverse levels of familiarity with technology and AI tools. They should be supported in critically and creatively using AI tools that enhance teaching and learning within sustainable ODL systems.

CONCLUSION

The study addressed the readiness and perspectives of pre-service teachers regarding the integration of AI in sustainable teacher education within an ODL context in South Africa. Participants illustrated varying degrees of readiness, with many lacking exposure and confidence in applying AI in educational contexts. This variation points to the urgent need for more deliberate and inclusive strategies to develop AI-related competencies in initial teacher education. In line with UNESCO's AI competency framework for teachers, developing readiness must be approached as a multifaceted goal in addressing technical skills as well as critical thinking, ethical awareness, and long-term pedagogical adaptability and growth.

The study is not without limitations. First, it focused on first-year BEd students in one South African ODL institution, which may hinder the generalisability of the findings. Second, the study relied on self-reported data from open-ended questionnaires, which may not fully capture the practical experiences or deeper conceptual understandings of technology and AI use. Third, while the UNESCO AI framework for teachers was useful to support the study, it did not assess progression beyond the "acquire" level. However, despite its limitations, the study adds to the literature and provides valuable information about pre-service teachers' readiness and perceptions of their AI integration within an ODL context in the global South. Future studies could investigate students' development of AI competencies over time, across different teacher education levels and institutions. Mixed methods approaches that include interviews and practical AI integration tasks could provide further rich insights into perceived as well as demonstrated readiness. In conclusion, the integration of AI in teacher education must be purposeful, ethical and sustainable, with particular attention to developing the readiness of pre-service teachers in ODL. Only through intentional curriculum design, equitable access, and ongoing support can teacher education programmes prepare future teachers to harness AI in their future classrooms.

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Community of Inquiry Framework: Alignment with Indigenous Ways of Understanding

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ABSTRACT

This article explores how Indigenous ways of understanding might align with the seven principles of blended and online learning that have been derived from the teaching presence sphere of the Community of Inquiry (COI) framework. The first two principles focus on the design a learning experience that creates a sense of open communication and trust. These principles align directly with the Canadian Inuit concept of *tunnganarniq*, which involves fostering a good spirit by being open, welcoming, and inclusive through shared storytelling. Principles three and four involve facilitating a collaborative environment where inquiry takes place in a cyclical rather than linear fashion. This aligns with the Anishinaabe Medicine Wheel framework that consists of four interconnected quadrants that create an ongoing cycle of learning. Principles five and six relate to directing the forward motion of the inquiry process. These principles involve the teacher and peers "nudging" fellow students forward to ensure that everyone in the community is successful. This aligns with the Lil'wat First Nation of Vancouver Island concept of *celhcelh*, in which people are responsible for their own and others learning, always seeking collaborative learning opportunities and support. Finally, the seventh principle ensures that assessment is aligned with learning outcomes and growth for all students in a learning experience. A criticism of Euro-American centric approaches to assessment is they focus solely on meeting curricular outcomes, and neglect the physical, emotional, and spiritual domains of students. Canadian Indigenous practices of assessment include the cognitive domain but focus equally on physical, emotional, intellectual, and spiritual growth and development.

Keywords

Community of inquiry; indigenous ways of learning; collaboration; shared metacognition; design and organization; storytelling; facilitation; medicine wheel; direct instruction; cyclical inquiry

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INTRODUCTION

As a Canadian of European background, I do not have first-hand experience with Indigenous concepts of learning. Despite this lack of personal experience, I would like to explore how Indigenous ways of understanding are aligned with the Community of Inquiry (CoI) framework (Garrison, 2017), and specifically the seven principles of blended and online learning (Vaughan et al., 2023).

To begin, Wilson (2012) indicates that the ability to collaborate is linked to the origin of human intelligence and evolution. Unfortunately, education systems have not always honoured and celebrated students' ability to collaborate. Wolf (2010), in his influential book '*Europe and the People without History'*, contrasts the Euro-American-centric focus on individual ways of knowing with more collaborative Indigenous ways of knowing.

The essence of Community of Inquiry's teaching presence sphere and the related seven principles is the reciprocal nature of teaching and learning. This is illustrated in the Māori of New Zealand's concept of *ako*, which means to both teach and learn (Alton-Lee, 2003). *Ako* recognizes the knowledge that both teachers and students bring to learning interactions, and it acknowledges how new knowledge and understanding can grow out of shared learning experiences. Within the Canadian context, Indigenous cultures have embraced collaborative approaches to learning for centuries.

For example, on the eastern coast, the Mi'kmaw Nation of Nova Scotia has developed a "two-eyed seeing" process in order to weave collaboratively Indigenous and Western ways of knowing: that is, "to see from one eye with the strengths of Indigenous ways of knowing, and to see from the other eye with the strengths of Western ways of knowing, and to use both of these eyes together" (Bartlett et al., 2012, p. 335). The Mi'kmaw Nation further indicates that the mind is like a parachute since it works only when it is open to new ideas and ways of knowing.

On the northern coast, the Inuit of Nunavut believe that we learn collaboratively not only from each other but also with and from our natural environment. Based upon this belief, they have developed an educational framework that they refer to as *Inuit Qaujimajatuqangit* (IQ). This framework consists of the following eight principles derived from extensive consultations with their Elders (Government of Nunavut, 2007):

1. *Inuuqatigiitsiarniq*—respecting others, relationships, and caring for people
2. *Tunngaŋarniq*—fostering good spirit by being open, welcoming, and inclusive
3. *Pijitsirniq*—serving and providing for family or community or both
4. *Aajiiqatigiinniq*—decision making through discussion and consensus
5. *Pilimmaksarniq* or *pijariuqsarniq*—development of skills through practice, effort, and action
6. *Piliriqatigiinniq* or *ikajuqtigiinniq*—working together for a common cause
7. *Qanuqtuurniq*—being innovative and resourceful
8. *Avatittinnik kamatsiarniq*—respect and care for the land, animals, and environment

In addition, on the western coast, the Lil'wat First Nation of Vancouver Island (Sanford et al., 2012) has articulated its own six principles for collaborative learning. They emphasize that learning should benefit the entire community and not just the individual. They also acknowledge that there is a felt

energy when a common purpose emerges for a group and that we should seek spaces of stillness and quietness for learning to unfold.

1.	*Kamúcwkalha*	Acknowledging the felt energy indicating group attunement and the emergence of a common group purpose
2.	*Celhcelh*	Understanding that we are responsible for our own and others' learning, always seeking learning opportunities
3.	*Kat'il'a*	Seeking spaces of stillness and quietness amid our busyness and quest for knowledge
4.	*Axekcal*	Valuing our own expertise and considering how it helps the entire community beyond ourselves
5.	*Cwelelep*	Recognizing the need sometimes to be in a place of dissonance and uncertainty so as to be open to new learning
6.	*Emhaka*	Encouraging each of us to do the best that we can at each task given to us

I would like to emphasize that throughout this article I have used resources from and references to Indigenous scholars and educators to explore how Indigenous ways of understanding might align with the seven principles of blended and online learning that have been derived from the teaching presence sphere of the Community of Inquiry framework.

THEORETICAL FRAMEWORK

An educational Community of Inquiry is a group of individuals who engage collaboratively in purposeful critical discourse and reflection to construct personal meaning and confirm mutual understanding (Garrison et al., 2025, "CoI Framework" section). The CoI theoretical framework was derived from the higher education literature. It is a generic educational model applicable to any number of educational contexts and modes of communication.

The CoI framework consists of three key elements or dimensions: social, cognitive, and teaching presence (see Figure 1). It is at the convergence of these three mutually reinforcing elements that a collaborative constructivist educational experience is realized. Social presence creates the environment for trust, open communication, and group cohesion. Cognitive presence has been defined as "the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse in a critical community of inquiry" (Garrison et al., 2001, p. 11). It has been operationalized through the developmental phases of inquiry: triggering events, exploration, integration, and resolution. The third and cohesive element, teaching presence, is associated with the design, facilitation, and direction of a Community of Inquiry. It is the unifying force that brings together the social and cognitive processes directed to personally meaningful and educationally worthwhile outcomes. Research studies have demonstrated that a high level of teaching presence is a good predictor of student success and satisfaction in a blended or online course (Shea et al., 2010; Torras & Mayordomo, 2011; Zhang et al., 2016; Zhao & Sullivan, 2017).

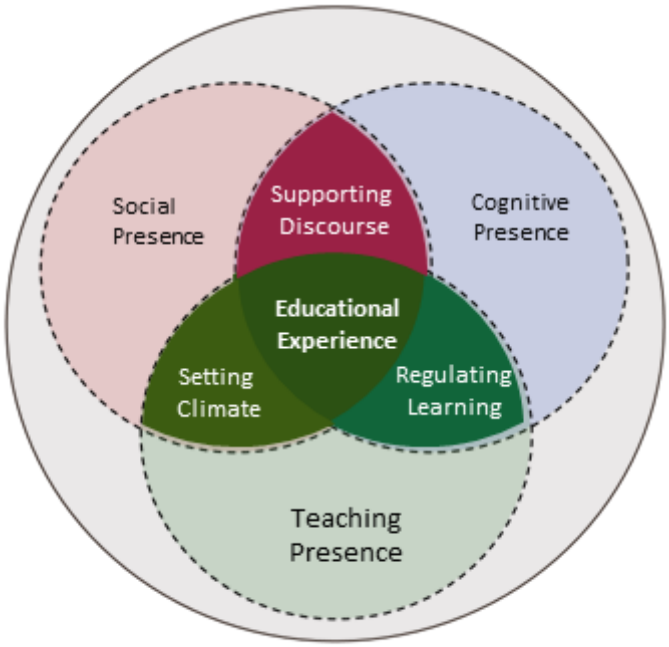


Figure 1. Community of Inquiry Framework (Garrison, 2017)

Shared Metacognition

The focus in higher education has slowly shifted from an individual approach to a more collaborative approach to learning (Kromydas, 2017). At the core of meaningfully engaged inquiry is the concept of metacognition, simply "thinking about one's thinking" (Chick, 2013, "Thinking about One's Thinking" section). Metacognition is key to learning how to learn. It means increasing awareness of the learning process and taking responsibility for controlling that process (Garrison, 2017). Metacognitive approaches to learning start with understanding and engaging where possible in designing and planning the learning experience.

Consistent with this approach, Garrison and Akyol (2015a) have developed a shared metacognition construct integral to the CoI framework (Garrison et al., 2000). Shared metacognition exists at the intersection of the cognitive and teaching presence constructs of the CoI framework and goes to the heart of a deep and meaningful educational learning experience (see Figure 1).

In terms of understanding shared metacognition and its role in a Community of Inquiry, the premise is that developing metacognitive awareness and ability is core to becoming an effective inquirer. Metacognition generally has been accepted as consisting of two components: awareness of the inquiry process (monitor) and implementation strategies (regulation). Awareness allows students to monitor and manage/regulate actively the inquiry process. In short, metacognition awareness and implementation abilities provide the knowledge and strategies to monitor and manage effective inquiry. Most importantly, in a collaborative learning environment, awareness and implementation techniques are developed through critical discourse and the requirement of participants to explain and justify their thinking to themselves and others. The approach to developing a viable metacognition construct for collaborative learning environments is to subsume self and shared regulatory functions within a single construct. This shared metacognition construct (Garrison, 2017; Garrison & Akyol, 2015a, 2015b) reflects the dynamic dimensions of self and co-regulation, each exhibiting a monitoring (awareness) function and a managing (strategic action) function (Figure 2).

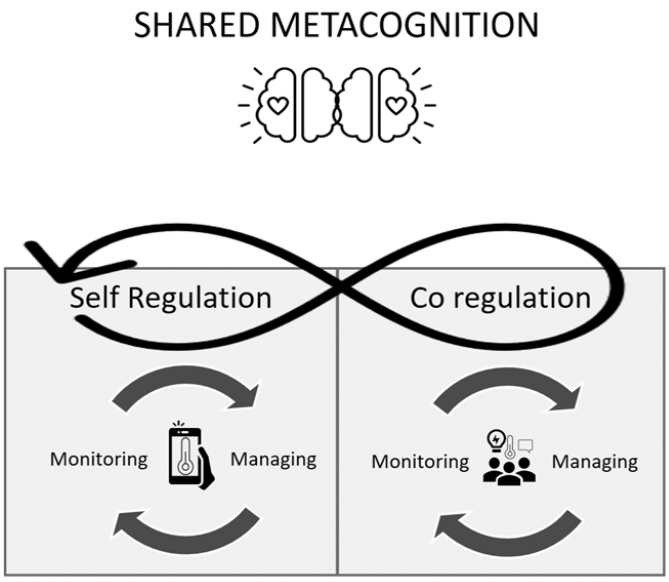


Figure 2. Shared Metacognition Construct (Vaughan et al., 2023)

To explore the practical implications of shared metacognition for a blended or online course, it is important to understand the construct of teaching presence.

Teaching Presence

Teaching presence is enhanced when students become more metacognitively aware and are encouraged. The issue of shared responsibility suggests that each student in a Community of Inquiry must take on some responsibility for social, cognitive, and teaching presence. This is why the third element of the CoI framework is labelled teaching presence and not teacher presence. It is not just the teacher who is responsible for social and cognitive presence issues. All students in a collaborative learning environment must assume varying degrees of teaching responsibility depending on the specific content, developmental level, and ability. From a cognitive presence perspective, the teacher and students must be prepared to clarify expectations, negotiate requirements, engage in critical discourse, diagnose misconceptions, and assess understanding. Students must also be aware of and active in social presence cultivation and ensure that all feel that they belong and are comfortable contributing to the discourse while simultaneously respectfully challenging ideas.

The pioneering innovation of virtual communication and community places both teacher and student in new ways of engaging, interacting, and contributing to learning. The challenge is that simply providing opportunities for interaction and collaboration does not ensure that students will approach their learning in deep and meaningful ways. The engagement of students in blended and online learning environments constitutes multiple roles and responsibilities. This multiplicity creates complexity since students must assume varying degrees of responsibility to monitor and regulate the dynamics of the learning community. This is consistent with the very nature of a Community of Inquiry with shared academic goals and processes.

Moving beyond the premise of shared responsibility, we must consider requirements embodied in the art of teaching in a blended and online learning environment. Teaching presence must be in the service of the learning objectives of the subject while attending to the needs and capabilities that students bring to the experience. However, the ways in which the role of effective teaching is crafted in blended and online learning environments are different and more complex. New roles for teachers and students

emerge and principles are required to guide this transition.to assume increasing responsibility for and control of their learning. Much attention needs to be focused on teaching presence if we are to create and sustain the conditions for higher-order learning.

Principles

Principles are essential to translate theoretical frameworks into coherent practical strategies and techniques. Principles become even more valuable in coping with the complexities of integrating new and emerging technologies such as generative artificial intelligence (GAI) applications. A principled approach to teaching that arises from a sustained Community of Inquiry takes us beyond the traditional lecture all too common in higher education. The principles that shape give structure to teaching presence encourage students to assume greater responsibility for and control of their educational experience.

Collaborative constructivist approaches are more than interaction and engagement. The educational methods needed today represent purposeful collaboration to resolve an issue, solve a problem, or create a new understanding. The educational process should be situated within the context of a learning community focused on purposeful inquiry in which students collaboratively assume increased responsibility and control to resolve specific problems and issues.

The seven principles illustrated below are derived from the CoI theoretical framework (Figure 3). These principles are organized around the three sub-elements or categories of teaching presence: design, facilitation, and direction. For each of these three functions and areas of responsibility, the elements of social and cognitive presence are also addressed. Considering the complexity of a collaborative learning experiences, considerable care and thought must be devoted to design, facilitation, and direction. The following principles provide a guide to creating and sustaining purposeful Communities of Inquiry.



Figure 3. Seven Principles of Blended Learning (Vaughan et al., 2023)

The first two principles speak to the social and cognitive challenge of designing a collaborative learning experience. The next two principles address the social and cognitive concerns associated with facilitating a Community of Inquiry. The last three principles deal with the social, cognitive, and assessment responsibilities of directing and leading an educational experience to achieve the desired outcomes. These seven principles comprise the first step in providing specific practical guidelines for the design, facilitation, and direction of a collaborative Community of Inquiry. I will now examine how these seven principles are aligned with Indigenous ways of learning.

ALIGNMENT OF PRINCIPLES AND INDIGENOUS WAYS OF LEARNING

Design and Organization

The first two principles, grounded in the CoI framework, relate to the design and organization of a blended or online course: design for open communication and trust that will create a learning community and design for critical reflection and discourse that will support inquiry.

The first principle of practice is the need to establish a social presence that will support open communication and the development of cohesive group identity. Social presence mediates between teaching and cognitive processes and has been shown to be associated with perceived learning and persistence (Eom & Arbaugh, 2011). The primary goal is to create a climate that encourages and supports open communication through a sense of belonging and trust.

The second principle focuses on the planning of the learning experience itself. The first task is the selection of subject matter, resources, and associated activities. This can be a daunting challenge if we are to encourage deep and meaningful approaches to learning and not overburden students with content and assignments. Please remember the saying “less is more,” and focus on conceptual understanding versus content coverage. Gooblar (2021, para. 10) advocates this approach in “Our Slimmed-Down Pandemic Pedagogy”: “I would much rather my students read one chapter closely, so that they’re able to understand its central concepts and discuss them in class, than skim three chapters and barely remember what they read. I’d rather they put their energies into completing a two-page assignment that engages their abilities in a manageable amount of time than struggle to finish a 10-page paper that brings them more anxiety than knowledge.”

Storytelling and the CoI Framework

Everyone has stories to tell, and storytelling can contribute to key social presence elements such as inclusion, connection, and the beginning of a class community (Health Foundation, 2016). Bashovski (2021) stresses how important storytelling is in the process of building a learning community. Ali (2017) suggests that storytelling can help to create “brave” spaces for inclusion and diversity in a higher education course. She suggests that some key guidelines that promote the most productive brave spaces are “controversy with civility,” “owning intentions and impacts,” “challenge by choice,” “respect,” and “no attacks” (pp. 3–4). She asserts that these ideas are not hard to implement if they are reinforced through storytelling, the design of the course, the syllabus, and the co-creation of engagement guidelines for the course.

Storytelling has played a central role in passing on certain Indigenous oral histories and teachings. Blackfoot Elder Little Bear (2012) indicates that the power of storytelling is that, each time we tell or

hear a story, we learn something new. It is an upward spiral of learning. The Indigenous resource Sharing through Story from the Alberta Regional Consortia (2022) also describes how stories can empower students who often feel marginalized in formal educational settings.

At the beginning of a course, students can engage in a storytelling exercise in which each reflects on an event that was a compelling learning experience—it might or might not have been related to school. The teacher can create a series of online discussion forums in the course learning management system and then randomly assign four or five students to each forum. First, have the students share their learning experiences in small groups and discuss why they were powerful. Second, debrief as a whole class on what makes the learning experiences powerful and then, using the CoI framework, co-create a set of engagement guidelines for the course.

These discussions should focus on students' roles and responsibilities in a blended or online learning environment. Encourage students to have conversations about past learning challenges and advice on overcoming them, such as sharing study and time management strategies. It is important to emphasize teaching versus teacher presence.

In addition, these initial discussions can help students to share and develop mindfulness practices. Palalas et al. (2020) indicate that students often feel a sense of isolation in blended and online courses and that shared mindfulness practices can help them to overcome this issue. They define "mindfulness" as "the awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment" (p. 247). They further indicate that this practice can help students to deal with the pressures stemming from the competing responsibilities and emotional demands of being online learners by developing self-regulated learning skills.

For a blended or online course, it is important to design and scaffold learning activities that support shared thinking and learning (shared metacognition) with an ethic of care for inclusivity (socio-emotional presence). It is important to keep in mind that creating a learning community takes time, so repetition and patience are important. To keep learners engaged and progressing toward intended learning outcomes necessitates leadership, specifically in facilitation. The next two principles focus on facilitation strategies and activities for creating and sustaining a Community of Inquiry in a blended or online course.

Facilitation

Facilitation is the central activity in an educational Community of Inquiry for developing worthwhile learning experiences as well as awareness and strategies (shared metacognition) through sustained reflection and discourse among students and the teacher. Facilitative actions, "on the part of both the students and the teacher, create the climate, support discourse, and monitor learning. In the act of facilitation, students connect with each other, engage with the content, are cognitively present as intellectual agents, and carry out all actions central to the development and maintenance of the learning community" (Vaughan et al., 2013, p. 46).

This transition from a teacher-centred to a learning-centred environment can be a challenge since many of us in higher education are conditioned to "teach how we were taught," focusing on content delivery rather than the facilitation of learning. As a result, there is a need to understand the concept of teaching presence for deep and meaningful learning outcomes since the focus is now on the learning process and conceptual understanding rather than content coverage. The CoI principles of

facilitation—establishing community and cohesion and inquiry dynamics (purposeful inquiry) for social and cognitive presence in a blended environment—are part of this required change.

The third principle is associated with social presence and focused on group identity and cohesion through open communication (Garrison, 2016). For students to be present socially, they must have the opportunity to interact. A Community of Inquiry emerges and maintains itself through the purposeful engagement, interaction, and relationships among members of the group. The teacher begins this process by encouraging, modelling, and supporting activities that allow each member of the group to become familiar with and possibly find a link to other members of the group. The nature and importance of these links become measures of the amount of cohesion found within each group and determine whether the group will or will not become a community. The more developmental and meaningful the engagement and interaction, the stronger the links, the greater the cohesion, and the more likely that deep and meaningful learning will occur.

The fourth principle is related to cognitive presence and reflects the facilitation of the process of inquiry. The Practical Inquiry process (Garrison et al., 2001) goes to the heart of cognitive presence and requires increasing amounts of cognitive effort and complexity. This process of changing complexity must be facilitated through appropriate discourse from a triggering event, exploration, integration to resolution, or application. Facilitation is necessary to set in motion and guide the dynamics of inquiry. In a blended environment, integrated face-to-face and online learning opportunities can allow for increased interaction, timely reflection, and continuous debate, all of which help to support the process of inquiry.

In essence, the teacher is responsible for modelling the development of shared metacognition in a course by helping to create and sustain constructive learning relationships (Littky & Grabelle, 2004). Creating a sense of community and collaboration is key to helping students develop their capacity (awareness and proficiency) for shared metacognition. Unfortunately, studies indicate that many students in higher education have little formal experience working collaboratively (Chang & Brickman, 2018).

Medicine Wheel

The COVID-19 pandemic demonstrated the need to pay greater attention to students' social-emotional well-being, especially in relation to group work, which can cause additional stress and conflict. Some teachers have begun to introduce the Indigenous Medicine Wheel framework in their blended and online courses in order to emphasize multicultural ways of knowing and being resilient.

The Medicine Wheel is a circle that consists of four quadrants (Figure 4). There are different ways that Indigenous Elders interpret these quadrants, such as the four directions, the four teachings, the four winds, and other relationships that can be expressed in sets of four (Bell, 2014). Often these four quadrants refer to the importance of balancing one's spiritual, physical, emotional, and mental capacities. The Anishinaabe have used the Medicine Wheel to develop a framework for Indigenous education that they call the Gift of Four Directions, which in some respects very similar to Garrison et al.'s (2000) Practical Inquiry model (Figure 5).

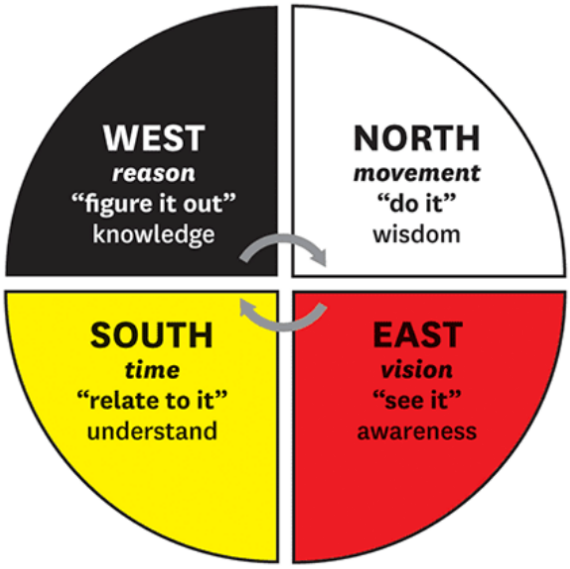


Figure 4. Gift of Four Directions (Bell, 2014)



Figure 5. Practical Inquiry Model (Garrison et al., 2000)

In the east quadrant, where the sun rises, the gift of vision is found, and one is able to see or identify the triggering event. In the south quadrant, one spends time relating to the vision, the exploration phase. In the west, one uses the gift of reason to figure it out, the integration phase. And in the north, one uses the gift of movement to do or actualize the vision, the application and resolution phase.

Cajete (1994, p. 42) emphasizes that learning and change will not "come into existence in a linear way, as the result of a single-minded drive, but in a cyclic, circular, collaborative way, working in all dimensions of a culture, moving from one position to another, not in reaction but in interaction with other forces." He adds that moving from linear models to the interconnectedness of the circle can guide the development of pedagogy and vision for the future.

Absolon (2019, p. 36) states that "the teaching and healing process is evolutionary and cyclical in nature, as is the continuum of medicine wheels. It begins with a desire to understand and identify with the balance, wholeness and interconnectedness expressed in the medicine wheel."

The medicine wheel teaches us that educators must become facilitators of learning rather than delivery vehicles of content. They must become more than a "guide on the side or sage on the stage." Facilitators must model the "ways of thinking in their disciplinary or professional practice" (Vaughan et al., 2013, p. 46). Of all the aspects of the CoI framework, the activities of facilitation are the most critical. Facilitation monitors and manages the overlaps (setting climate, supporting discourse, and regulating learning) between the presences and is at the core of the dynamics of a Community of Inquiry (see Figure 1).

Facilitation is most critical in the earliest stages of student interaction, whereas direct instruction becomes more important as the complexity and cognitive load of a task or an assignment increase. My experience suggests that facilitation is necessary to set in motion the dynamics of inquiry, but direct instruction is required when techniques of facilitation no longer move the process of inquiry to the integration and resolution/application phases. The next two principles focus on strategies of direct instruction that "nudge" students further along in their process of inquiry and help to improve their ability to monitor and manage shared metacognition.

Direct Instruction

Direct instruction is not about lecturing; rather, it is about scholarly and pedagogical leadership. It is an essential ingredient of any formal educational experience in order to help students learn how to take responsibility collaboratively to monitor and manage their learning (shared metacognition). It has been shown that students expect structure and leadership in higher education courses, and the roles and responsibilities of direct instruction should be shared by all members of a Community of Inquiry (Garrison & Cleveland-Innes, 2005). Individual and collaborative metacognition serves to guide the process of inquiry and to encourage timely progression toward learning goals. Direct instruction is about ensuring that students achieve the intended learning outcomes of a course or program, and it is related specifically to the fifth principle, sustain respect and responsibility for collaboration, and the sixth principle, sustain inquiry that moves to resolution and shared metacognitive development.

The fifth principle is associated with social presence responsibilities. This principle focuses on sustaining a supportive environment and addressing issues that can undermine the group's trust and sense of belonging. Recall that social presence is concerned with open communication, group cohesion, and interpersonal relationships. Maintaining an open and cohesive Community of Inquiry requires a sensitive and sustained focus on the intended learning outcomes (identification with the purpose of the course). Sustaining the climate, being committed to the purposeful collaborative process, and developing interpersonal relationships are the essence of this principle. During the process of facilitation, the initial challenge is to establish these properties of a Community of Inquiry. Once established, the ongoing challenge is to ensure that they are sustained and to address issues that can undermine the climate that mediates academic discourse.

The sixth principle addresses issues of cognitive presence. This concerns scholarly leadership and is associated with critical discourse, reflection, and progression through the phases of Practical Inquiry. Direct instruction is tasked specifically with ensuring systematic and disciplined inquiry. Sustaining purposeful inquiry includes several overlapping responsibilities. They include providing students with ongoing feedback and academic direction. The overriding responsibility of direct instruction is to ensure that students move through the phases of inquiry and do so in a timely manner. This was one of the challenges revealed in the early research on the CoI framework (Garrison, 2017). In addition to

task design deficiencies, it was found that direct instruction was lacking in terms of moving to the resolution phase. Ensuring progression to that phase in the context of collaborative inquiry requires that students maintain a focus on the task, which requires resolution, and that issues are resolved quickly.

Cyclical Nature of Inquiry

"We teach how we were taught" is a common saying, and many of us in higher education focus on an individualistic, linear approach to learning and therefore find it challenging to adapt to a cyclical and iterative approach to inquiry. I previously described how Garrison et al.'s (2000) Practical Inquiry (PI) model is aligned with the Anishinaabe Medicine Wheel framework for education (Bell, 2014). Both models consist of four interconnected quadrants that students move through in a cyclical nature.

In the CoI framework (Garrison, 2017), the Practical Inquiry (PI) model is interconnected with social and teaching presence. The Medicine Wheel involves balancing one's spiritual, physical, emotional, and mental capacities (Toulouse, 2016). Shanker (2014, p. 1) states that, "instead of seeing reason and emotion as belonging to separate and independent faculties (the former controlling the latter), they [a multitude of researchers] argue that social, emotional and cognitive processes are all bound together in a seamless web."

This recognition of interconnectedness as a primary concept in learning and emotional development is central to some Indigenous views of education (Carriere, 2010; Iseke, 2010). The key for us as educators is to demonstrate explicitly to our students the cyclical and interconnected nature of inquiry.

We as teachers are the primary but not sole leader in a Community of Inquiry. Similar to a captain's responsibility for moving a ship forward, the teacher needs to encourage students to move beyond exploration to the integration and resolution phases of inquiry. As with facilitation, there is a delicate balance with direct instruction. Too much or too little direction from the teacher will affect adversely the engagement of students and their willingness to assume metacognitively the responsibilities of teaching presence. Direction in a Community of Inquiry is grounded in shared metacognition. That means being aware of intended goals and managing progression toward intended learning outcomes. Participants in a learning community must not only be aware metacognitively of the process of inquiry but also share thoughts regarding the positive development of collaborative inquiry. That is, learners must be prepared to offer direction that will move the discourse through to resolution in a timely manner. Consistent with the previous comments, metacognitively informed direction includes a strong assessment component, the final principle.

Assessment

The term "assessment" in higher education often conjures up different sentiments and emotions. From a teacher's perspective, Ramsden (2003, p. 180) states that assessment involves "getting to know our students and the quality of their learning." Conrad and Openo (2018) suggest that assessment fundamentally shapes approaches to learning and reveals the qualitative nature of the educational experience. Yet students in a research study were asked to use one word to describe their perceptions of assessment (Vaughan, 2013). The four most common words were fear, stress, anxiety, and judgment.

This disconnect between teacher and student perceptions regarding assessment is a serious issue, especially since a number of educational researchers have clearly linked student approaches to

learning with the design and associated feedback of an assessment activity (Biggs, 1998; Hedberg & Corrent-Agostinho, 1999; Marton & Saljo, 1984; Ramsden, 2003; Thistlethwaite, 2006). For example, standardized tests with minimal feedback can lead to memorization and a surface approach to learning, whereas collaborative group projects can encourage dialogue, richer forms of feedback, and deeper modes of learning (Entwistle, 2003). In addition, a report by the International Commission on the Futures of Education (2021) advocates that assessment needs to evolve from a mode of compliance to a process of shared goal setting, which leads to growth.

This focus on development is closely aligned with some Indigenous perspectives on assessment. Claypool and Preston (2011) state that Euro-American-centric assessment practices focus on written quizzes, tests, and exams, which primarily promote cognitive development via rational, linear, and accountable activities. They suggest that this approach to assessment is focused largely on meeting curricular outcomes, and it tends to neglect the physical, emotional, and spiritual domains of students. Marule (2012) suggests that effective assessment from an Indigenous perspective utilizes practices that include the cognitive domain but focus equally on physical, emotional, intellectual, and spiritual growth and development. The seventh principle of blended and online learning, then, is ensuring that assessment is aligned with learning outcomes and growth for all students.

This involves a circular rather than linear approach to assessment. Self, peer, and teacher assessments should be an integrated process rather than a series of isolated events in order to help all students develop shared metacognitive awareness and strategies. For example, a student in a teacher education study commented that “I used self-reflection for checking my work and making sure I had everything I needed. I used peer-review for a different perspective on my work, and I used teacher feedback to understand how I could improve my work” (Vaughan, 2010, p. 23). Another student in the study stated that “self-reflection showed me what I liked about my work and what needed to be improved, peer feedback gave comments on what could be done better and then teacher feedback gave ideas on how the assignment could be fixed up to get a better mark” (p. 23).

In addition, these students stressed how digital technologies helped them to integrate these three forms of assessment into a circular approach (Figure 5).

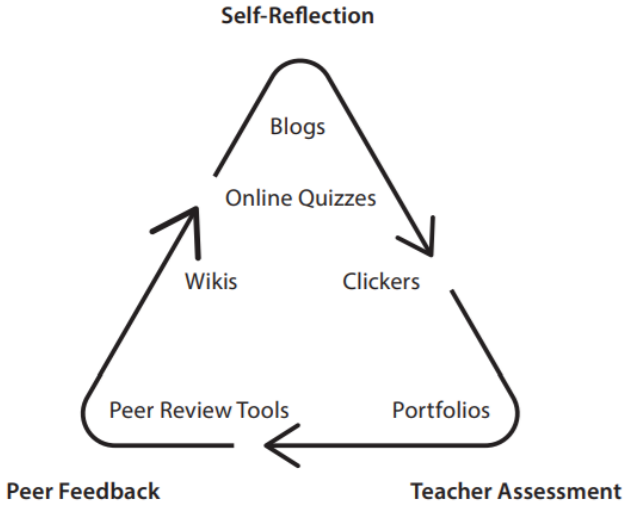


Figure 5. Using Digital Technologies to Support a Triad Approach to Assessment (Vaughan et al., 2023)

This circular approach involves students using rubrics, blogs, and online quizzes to provide themselves with self-reflection and feedback on their course assignments. They can then receive further peer feedback on their course work via digital technologies such as classroom response systems and calibrated peer review tools. Finally, teachers and, in some cases, community experts can review students' e-portfolios and use digital video technologies to observe student performance, diagnose student misconceptions, and provide additional assessment feedback.

An international call for a greater focus on assessment for learning, rather than on assessment for just measurement and accountability of student performance, is well documented in the educational research literature (Yeh, 2009). The use of digital technologies to support student assessment can lead to Hattie's (2009, p. 238) vision of a visible teaching and learning framework in which "teachers SEE learning through the eyes of their students and students SEE themselves as their own teachers."

CONCLUSION

My hope is that this article has demonstrated that the Community of Inquiry's collaborative and cyclical approach to learning is closely aligned with Indigenous ways of knowing. As cited in the Introduction, Wilson (2012) indicates that the ability to collaborate is linked to the origin of human intelligence and evolution. Humans have an innate ability to share their thoughts through communication that allows the group to accomplish more than the individual can alone. The era of COVID-19 has demonstrated to us that, when we collaborate at an international level, we can solve global problems. The hope is that we can now apply these global strategies of collaboration to other pressing issues, such as the climate crisis.

In the context of higher education, the historical ideal has been to learn in collaborative communities of inquiry, which can foster the growth and development of shared metacognition (Lipman, 1991). This has been demonstrated by Indigenous communities over time throughout the world. I would now like to summarize how the seven principles of blended and online learning that have been derived from the teaching presence construct of the Community of Inquiry align with Indigenous ways of knowing.

The first principle involves designing for open communication and trust in order to create a blended or online learning community. This principle addresses the need to establish a social presence to support open communication and the development of cohesive group identity. The primary goal is to create a climate that encourages and supports open communication through a sense of belonging and trust. This principle aligns directly with the Canadian Inuit concept of *tunnganarniq*, which involves fostering a good spirit by being open, welcoming, and inclusive (Government of Nunavut, 2007). Storytelling is a common Indigenous practice to create such a learning environment. Everyone has stories to tell, and storytelling can contribute to key social presence elements such as inclusion, connection, and the beginning of a class community (Health Foundation, 2016). In addition, Blackfoot Elder Little Bear (2012) indicates that the power of storytelling is that, each time we tell or hear a story, we learn something new. It is an upward spiral of learning.

The second principle is designing for critical reflection and discourse to support inquiry. This principle focuses on cognitive presence, and we can often encounter the challenge of "pathological politeness" when trying to apply this principle in practice in regard to peer feedback. Garrison (2017, p. 53) documented how students often are unwilling to disagree with or challenge each other in a higher education course, especially in online discussion forums, since they do not want to offend or hurt anyone's feelings, a sense of "pathological politeness." To overcome this issue, the Lil'wat First Nation

of Vancouver Island emphasizes the importance of *cwelelep* (Sanford et al., 2012). This concept recognizes the need sometimes to be in a place of dissonance and uncertainty so as to be open to new learning. This is similar to Piaget's (1975) notion of cognitive dissonance, which Piaget suggested led to knowledge acquisition through assimilation to and accommodation with our existing mental frameworks.

The third principle is the importance of establishing community and cohesion in a blended or online course. This principle is associated with social presence and focused on group identity and cohesion through open communication. For students to be socially present, they must have the opportunity to interact with each other. Again, the challenge is that many students in higher education have limited experience and guidance with how to work collaboratively in a group. It is crucial that the teacher provide the students with guidance and opportunities to learn how to collaborate effectively in a group. We discussed Tuckman's (1965) five stages of group development, which in many ways align with the Indigenous Medicine Wheel that consists of four quadrants. Some teachers have begun to introduce this framework in their blended and online courses in order to emphasize multicultural ways of knowing and resilience in group settings (Bell, 2014).

The fourth principle is establishing the dynamics of inquiry in a blended course, which relate to the cognitive presence sphere of the CoI framework, derived from Garrison et al.'s (2000) Practical Inquiry model. Facilitation is necessary to set in motion and guide the dynamics of inquiry. In a blended environment, integrated face-to-face and online learning opportunities can allow for increased interaction, timely reflection, and continuous debate, all of which help to support the process of inquiry. As we discussed, the challenge for many of us in higher education is that we have been conditioned to focus on an individual, linear approach to learning and thus find it difficult to adapt to a cyclical and iterative approach to inquiry. We illustrated how the PI model aligns with the Anishinaabe Medicine Wheel framework for education (Bell, 2014). Both models consist of four interconnected quadrants that students move through in a cyclical nature. The key for us as educators is to demonstrate explicitly to our students the cyclical and interconnected nature of inquiry.

The fifth principle involves sustaining respect and responsibility for collaboration. This principle is associated with social presence responsibilities. It focuses on sustaining a supportive environment and addressing issues that can undermine the group's trust and sense of belonging. Recall that social presence is concerned with open communication, group cohesion, and interpersonal relationships. The Canadian Inuit refer to this principle as *inuuqatigiitsiarniq*, which involves respecting others, developing relationships, and caring for people (Government of Nunavut, 2007). The Inuit indicate that this is a lifelong disposition that needs to be reinforced throughout one's educational journey.

The sixth principle is about sustaining inquiry that moves to resolution and shared metacognitive development. The principle addresses issues of cognitive presence. It concerns scholarly leadership and is associated with critical discourse, reflection, and progression through the phases of practical inquiry. This principle involves the teacher and peers "nudging" fellow students forward in their academic studies (Thaler & Sunstein, 2008). This aligns with the Lil'wat First Nation of Vancouver Island concept of *celhcelh*, in which people are responsible for their own and others learning, always seeking collaborative learning opportunities and support (Sanford et al., 2012).

Finally, the seventh principle ensures that assessment is aligned with learning outcomes and growth for all students in a blended course. In regard to this principle, we indicated that a report by the International Commission on the Futures of Education (2021) advocates that assessment needs to

evolve from a mode of compliance to a process of shared goal setting, which leads to growth and development for all students. This approach to assessment is aligned closely with Indigenous perspectives. Claypool and Preston (2011) state that Euro-American-centric practices of assessment focus on written quizzes, tests, and exams, which primarily promote cognitive development via rational, linear, and accountable activities. They suggest that this approach to assessment is focused largely on meeting curricular outcomes, and it tends to neglect the physical, emotional, and spiritual domains of students. Marule (2012) suggests that effective assessment from an Indigenous perspective utilizes practices that include the cognitive domain but focus equally on physical, emotional, intellectual, and spiritual growth and development.

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Generative AI in Teacher Education: From Theory to Practice

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ABSTRACT

This study investigates how pre-service teachers are learning to use generative artificial intelligence (GAI) applications through the integration of their course and practicum-based experiences. The five core competencies of our Bachelor of Education program were used to guide the research: planning, assessment, inclusive environment, facilitation, and professional responsibilities. The findings suggest that the teacher candidates are currently focused on learning how to use GAI for lesson planning and student assessment. Use of GAI to support an inclusive environment and facilitate student learning is presently limited. In terms of professional responsibilities, at this point in time there appears to a lack of guidance at both the university and K-12 school level regarding the ethical use of GAI. this study demonstrates that the growing importance of GAI in teacher education means that it needs to be dealt with at the program level rather than just in a single educational technology course. For example, ethics courses, case studies of AI use in educational settings, and guided discussions on potential GAI scenarios need to take place throughout the program.

Keywords

generative AI; teacher education; planning; facilitation; assessment; inclusive environment; professional responsibilities

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INTRODUCTION

ChatGPT (generative pre-trained transformer) was introduced to the public by OpenAI in November 2022 and has been credited with catalyzing widespread interest in generative artificial intelligence (Mhlanga, 2023). In less than two years, the use of generative artificial intelligence (GAI) technologies has exploded in all forms of education and the workplace (Green, 2024). Most of the research to date has been focused on how students are using generative AI in their academic studies (Ascione, 2024). There are currently relatively few studies that focus on how pre-service teachers are being prepared to integrate this type of technology into their future teaching practices. The ChatGPT (OpenAI, 2025) prompt, "Why conduct a research study on the use of generative artificial intelligence in a teacher education program?" yielded the following response:

Conducting a research study on the use of generative artificial intelligence (GAI) in a teacher education program can provide valuable insights into its potential benefits, challenges, and implications for future educators. Here are some key reasons why such a study is important:

1. Enhancing teaching and learning
2. Developing AI literacy in educators
3. Efficiency and productivity
4. Ethical and pedagogical implications
5. Innovation in teacher training
6. Impact on student learning outcomes
7. Bridging the gap between theory and practice

This study focuses on bridging the gap between theory and practice by investigating how teacher candidates are learning to incorporate the use of GAI applications in their third-year practicum. The hope is that the findings from this study will result in learning strategies and approaches that can be used in a mandatory educational technology course (EDUC 3326: Understanding Current and Emerging Pedagogical Technologies) to help teacher candidates ethically and effectively use these applications in their field experiences, practicums, and future teacher practice.

LITERATURE REVIEW

There has been an extensive history of the use of artificial intelligence (AI) applications in the field of education (Wang et al., 2024). With the introduction of ChatGPT in November 2022, there has been some confusion about the difference between traditional AI and generative AI. Marr (2023, July 24) states that the main difference lies in their capabilities and applications. For example, traditional AI systems are primarily used to analyze data and make predictions, excelling at pattern recognition. Generative AI goes a step further by creating new data similar to its training data, excelling at pattern creation. Traditional AI can analyze data and tell you what it sees, but generative AI can use that same data to create something entirely new.

Bae et al. (2024) describe how pre-service teachers have unique characteristics in that they possess multifaceted identities as both current students and future educators. They suggest that these dual roles significantly shape their pedagogical approaches and perspectives on adopting GAI technologies. A study by Pajares (1992) demonstrated the importance of pre-service teacher beliefs/pre-conceptions, as it is widely acknowledged that pre-service teachers enter teacher training programs with firmly established ideas about learning and teaching that are developed during their prior

experiences as students. These initial ideas can act as filters, shaping how pre-service teachers perceive and interpret new information and tools they encounter. In other words, the pre-service teacher preparation effort is crucial in facilitating transformative learning experiences, wherein pre-service teachers assume dual roles/positions—not merely as passive recipients of knowledge but also as active participants in dialogue that critically and practically engages them with the technological and ethical aspects of tools for their learning (i.e., as an undergraduate student) as well as teaching (i.e., as a pre-service teacher).

Tondeur et al. (2012) suggest that pre-service teachers, who are still in the process of forming their teaching philosophies and practices, may exhibit different attitudes and behaviours toward technology compared to their in-service counterparts. Pre-service teachers are often more open to adopting new technologies and pedagogical approaches, as they have not yet established deeply rooted teaching practices. Moreover, pre-service teachers' dual roles as learners and prospective educators uniquely position them to critically engage with GAI tools and their implications for both their learning and their future teaching experiences.

Pre-service teacher education programs around the globe have begun to consider the impact and role of GAI in their curriculum. For example, a study was conducted by Nyaaba (2024) to examine the potential roles and impacts of GAI in addressing persistent challenges in teacher education within developing countries, using Ghana as a case. The findings suggest that GAI could act as a catalyst for systemic change by alleviating the burden of content knowledge acquisition, thereby freeing up time for teacher educators to focus on pedagogical modelling and performance-based assessments.

Another study conducted in Kenya by Fundi et al. (2024) demonstrated that teachers' confidence in GAI was a significant predictor of their readiness to incorporate GAI into K-12 school curricula. The findings also highlighted the crucial role of GAI ethics in shaping teachers' preparedness to teach with these applications. The results from this study are being used as a basis for education policy change on GAI education in Kenya. Such as transforming the teacher education curriculum to include GAI as well as designing GAI professional development programs for in-service teachers to ensure they are well-equipped to teach GAI.

In China, a study by Zhao et al. (2022) concluded that in order to improve teachers' GAI literacy, the choice of curriculum, content, methods, and practical resources should be diverse and committed to making GAI literacy an essential enabler for teachers' sustainable future development. These comments are echoed by Baskara (2023) in Indonesia, who advocates for "the urgent need for teacher education to equip its wards with a robust foundation in data literacy and a comprehensive understanding of GAI tools" (p.416). He emphasizes that this shift marks a revolution in the traditional teaching paradigm, making data literacy an essential skill akin to literacy and numeracy in the previous century.

Finally, in Canada, MacDowell et al. (2024) recommend providing pre-service teachers with experiential (hands-on) learning opportunities with GAI applications in order to firsthand understand the benefits and limitations. Their study describes the process of teacher candidates creating an open educational resource (OER) book about their experiences using GAI tools in their Bachelor of Education program (ETAD 402, 2023).

THEORETICAL FRAMEWORK

An action research methodology was used for this study (Stringer, 2014). This approach involved teacher candidates reflecting on how they were learning to use generative AI applications in the mandatory educational technology course and then how they were practically applying this learning in their 3rd-year teacher practicum. The intent of this action framework is to have some practical outcome related to the lives or work of the participants, which in this case is the ethical and effective use of generative AI applications (GAI).

In addition, our university's Bachelor of Education five core program competencies have been used to guide this study (Figure 1).



Figure 1. Our university's Bachelor of Education program's five core teaching competencies ©The Author

These competencies were derived from the work of Danielson (2011) and Friessen (2009). Table 1 provides the definition for each of our program's five core competencies.

Table 1. Core competency definitions

Competency	Definition
Professional Responsibilities	Refers to the knowledge, skills, and ethical dispositions that teacher candidates must demonstrate to uphold professional standards, foster a positive learning environment, and contribute to the broader educational community. This competency ensures that teacher candidates not only possess subject matter expertise but also act as responsible, ethical, and reflective practitioners who contribute positively to the educational system.
Planning	Refers to the ability of teacher candidates to design, organize, and implement effective instructional strategies that align with curriculum standards, student needs, and educational goals. This competency ensures that our teacher candidates can create meaningful, engaging, and differentiated learning experiences. This competency also ensures that they are well-prepared to deliver structured, effective, and learning-centered instruction.
Assessment	Refers to a teacher candidate's ability to design, implement, analyze, and use assessments effectively to measure student learning and inform instructional decisions. This competency ensures that our teacher candidates can evaluate student progress accurately and use data-driven strategies to enhance teaching and learning. This competency is essential for fostering a learning-centered environment where assessments are not just tools for grading but also instruments for continuous improvement.

Inclusive Environment	Refers to a teacher candidate's ability to create and sustain a learning environment that respects and supports the diverse backgrounds, abilities, and needs of all students. This competency ensures that every learner feels valued, safe, and empowered to succeed. This competency prepares our teacher candidates to foster an equitable and supportive educational environment where all students, regardless of their backgrounds or abilities, can thrive.
Facilitation	Refers to a teacher candidate's ability to guide, support, and enhance student learning through effective instructional strategies, active engagement, and learning-centered approaches. This competency ensures that our teacher candidates can create dynamic and interactive learning experiences that foster critical thinking, collaboration, and deep understanding.

STUDY CONTEXT

Our university offers a four-year Bachelor of Education program. In the fall of the third year, teacher candidates are engaged in a series of campus, place-based, and practicum experiences that focus on integrating Science, Technology, Engineering, Arts, and Math (STEAM) education.

The semester begins with teacher candidates spending the first week in their practicum placements, helping their mentor teachers start the new school year with their K–9 students. The teacher candidates then spend one day a week in their mentor teacher's classroom for two months, culminating in a five-week practicum experience.

On campus, the teacher candidates are engaged in a series of STEAM education courses that are connected to field trips. These trips include an overnight camp experience at Camp Connect (Connect Charter, 2025) and an interactive day at the Telus SPARK Science Centre (Spark Science, 2025).

This research study focuses on the educational technology course, which is included in the STEAM semester. The purpose of this course is to provide an overview of technological influences in education. It is designed to assist prospective teachers in critically examining current and evolving applications of technology relevant to the teaching and learning process.

METHODOLOGY

A qualitative case-study research approach was used to guide the collection and analysis of the study data (Creswell & Creswell, 2018). The two main forms of data collection were the teacher candidates' blogs (reflective journals) and post-course interviews.

Teacher candidates in the educational technology course utilized a blog (reflective journal) throughout the semester. At the beginning of the fall 2024 semester, teacher candidates completed an initial blog posting that asked them to describe their previous experience with generative AI applications (e.g., ChatGPT (OpenAI, 2025)) and how they have used them (e.g., writing assignments). The teacher candidates also completed a final blog posting at the end of the semester that asked them to describe how they used GAI applications in their 3rd-year practicum (e.g., not at all, lesson planning, assessment).

After the completion of the fall 2024 semester, teacher candidates were invited to participate in a 30-minute interview. The interview consisted of the following questions:

1. Please elaborate on the use or non-use of GAI applications in your practicum (e.g., lesson planning, assessment)?

2. How did you learn to use these GAI applications in your practicum (e.g., educational technology coursework, mentor teacher, yourself, others)?
3. How do you plan to use GAI applications in your future teaching practice?
4. How could the educational technology course better prepare you to ethically and effectively use generative AI applications in your university practicums and future teaching practice?

FINDINGS

The findings are reported in alignment with the chronological sequence of data collection: initial blog posting, final blog posting, and follow-up interviews.

Initial Blog Posting

There was a total of 85 teacher candidates (TCs) enrolled in the EDUC3326 course for the fall 2024 semester. Ninety-two percent of these TCs were female, and eight percent were male. The participants in this research study completed their initial blog posting during the first week of the fall semester in September 2024. For this initial blog posting, fifty-three percent of the TCs reported that they had previously used GAI applications. Many of the TCs in this initial posting expressed concerns about the use of GAI applications in all forms of education. Their main concerns are summarized in Table 2.

Table 2. Concerns about the use of generative AI applications in education

Concern	Quotation for initial blog posting
Academic misconduct	*When AI was first introduced to me, it was through the platform ChatGPT (OpenAI, 2025). The initial buzz around the application was that it could "do your homework for you," as it can provide you with essays worth of information if prompted correctly. At this time I was hesitant to use AI to assist me with my homework because I was afraid of being accused of academic misconduct* (Participant 24).
Dependency and overreliance on AI applications	*When AI first came out, I was very hesitant to use it, as I figured that I simply did not want to become dependent on AI use. I found the idea of "only using AI and not critically thinking for myself', to be a scary thought* (Participant 4).
Validity and bias of information	*Although AI is helpful, it is important to be aware of the information and resources that are provided, as AI is not always accurate and can have bias.* (Participant 45).
Security issues	*There are also the data security implications of mass feeding the works of students and teachers into a machine designed to reproduce them. That there is even a chance that it could, on a whim, spit out confidential information that a student or teacher might have happened to write about in something that was fed into the training data is something that shouldn't even be a risk, but school districts are seemingly intent on deliberately making one anyways. As to why school systems want to actively invite the all-consuming plagiarism machine into their schools is beyond me, but I'll be ardently against it the entire way* (Participant 82).
Ethical use	*With great power comes great responsibility... Of course, AI is useful. However, it needs to be used and taught with boundaries and respect. Students should be able to explore AI in a safe space, with set boundaries, and in appropriate ways that benefit their learning* (Participant 68).
Depersonalization of learning	*It would also go without saying that I take great issue with the rampant adoption of generative tech by everything, education included in an effort to hop on a bandwagon and excise the human element from fields where it is desperately needed.*

	Education is a field where personalization of content delivery and curriculum is considered one of the most important things you can do, so the rush to remove that element from it and run assessments through a machine with no frame of reference of your class or students seems actively counter-productive. Combined with the general lack of technical proficiency that runs through the education field, I have almost no doubts that rushing to implement a technology that none of its users actually understand will lead to haphazard implementation and a notable decline in the efficacy of assessment. (Participant 82)
Moral issues	*I also have plenty of moral reasons to be against current generative models. Given that they're built by indiscriminately scraping data from writers, artists, and creatives without their consent or permission and without compensation only to be spat back out as soulless algorithmically reproduced content devoid of any of the humanity or creativity that went into the creation of the works that they're shamelessly ripping off* (Participant 82).

Final Blog Posting

There was a total of 84 teacher candidates who successfully completed their five-week practicum during the fall 2024 semester. These TCs returned to the university for a final class during the second week of December 2024, where they completed their final blog posting.

For this final blog posting, 94% of the TCs reported that they used GAI applications in their practicum placement. The 6% who did not use these applications provided the following reasons (Table 3).

Table 3. Reasons for not using generative AI applications in practicum

Reason	Quotation from final blog posting
Lack of confidence	I did not use AI in my practicum as I am not comfortable with it. (Participant 67).
Plagiarism	I didn't. I see no reason to actively lower the quality of my work in any capacity just so I can use a trend that people are hopping on the bandwagon of without actually understanding any of the implications behind it. I felt no reason or no particular need to engage with a mass plagiarism engine in order to plan lesson plans, especially since my own planning allowed me to more effectively account for the individual needs of my very complex classroom in a more targeted and specific way than AI ever could. (Participant 82)
Dependency and over reliance on AI applications	*I decided over the course of this practicum that I would not use AI to plan lessons or assist me in the process. I decided this because after experimenting with AI prior to my practicum, I found that although the lessons often seemed like they would work well; they weren't tailored to the group of students I was teaching, and they didn't include my ideas. I also felt that using AI would take away from my learning as a pre-service teacher, and I wanted to become self-sufficient in creating and planning learning experiences before using AI.* (Participant 83).

The five core teaching competencies for our BEd program were used to categorize the TCs teaching use of GAI applications in their five-week practicum placement.

Planning

The most prevalent use of these applications was related to the planning category. Sixty-one percent of the TCs reported that they used GAI to support their lesson planning. They identified the following four themes (Table 4).

Table 4. Lesson plan themes for use of generative AI technologies

Theme	Quotation from final blog posting
Ideation	*Throughout my practicum, I utilized AI in many different ways. Firstly, I (brainstorming) used it to help me brainstorm ideas for integrated lesson plans. For example, I used it to help me connect science and math by generating scenarios for my students to develop statistical questions from. This made my process much shorter and allowed me to critically think about what was generated and how I needed to adapt it to make it more useful in my classroom* (Participant 3).
Efficiency	*When lesson planning became hectic, I turned to AI to generate ideas using the Alberta Curriculum. This was my first semester using it, and I was amazed at how precise the lessons were. Of course, there were adjustments. However, it took the weight off my shoulders from trying to think of new lessons every week. Using AI felt like a breath of fresh air and gave me back some valuable time I could use elsewhere* (Participant 39). *By leveraging AI, I've been able to cut down on the time I spend planning while still producing detailed and effective lesson plans. This has allowed me to maintain a healthy work-life balance, ensuring that my evenings are not entirely consumed by planning and preparation* (Participant 50).
"I can" statements	*When planning my lessons, the main thing I used AI for was to create my "I can" statements using the specific KUSPs* (Participant 11). *I used AI applications for the majority of my lesson planning throughout my practicum. I mainly used it as a tool for simplifying 'I can statements' into grade three vocabulary and language* (Participant 41).
Real-world	*I used it in helping come up with creative ideas for words, titles, or relevance sentences within my lesson plans, such as in the real-world relevance section of our lesson plans. By using AI applications, such as Chat GPT, in that section of my lesson plans, I have been brought aware to so many real-world applications that I would not have even thought about. I appreciate it for bringing me aware of things outside of what I know about the subject* (Participant 62).

Assessment

After planning, the assessment competency was the one most often referred to in the TC's final blog postings. Over one-third of the TCs described how GAI applications helped them create rubrics in their practicum placements. For example, "

> *When it was time for assessment, I used MagicSchool AI (2025) to help create rubrics by entering the grading point scale (1-4) and the criteria I was going to mark them on. This helped me get a baseline, and I was able to edit anything that needed to be changed to make more sense*. (Participant 11).

Another TC commented,

> *I used AI to help me generate a rubric format. During a whole-class activity, I worked with the students to co-create a rubric by writing down their ideas about what they thought a "4" product should look like. Together, we created a list of success criteria, which I then input into AI to format into a clear, professional rubric. This process was not only convenient and time-saving but also allowed me to incorporate student voice directly into the assessment tool*. (Participant 17).

Several of the practicum schools during the fall 2024 semester were experimenting with the use of GAI in the report card process, and thus, a few TCs gained some first-hand experience.

> *I learned about how to use Microsoft CoPilot (2025) to aid in writing report card comments in one of the professional development days. The principal showed us how to safely use this and created a template to enter into the AI chat to ensure that it was professional and followed the report card guidelines*. (Participant 18).

Another TC described how her mentor teacher used generative "*AI to draft thoughtful, specific comments for report cards, streamlining the process*" (Participant 16).

In addition, five TCs commented on how they used GAI to develop formative assessment tools and activities. For example, "*AI also helped me develop formative assessment tools like questions and charts to track student progress and understanding effectively*" (Participant 8). And,

> *For assessment, asking MagicSchool (2025) to create a "quiz" for me using the Learn Alberta curriculum was useful for creating exit/entry tickets. I would take some key questions from the quiz that was AI-generated and create my own exit ticket or assessment on Canva (2025). This was great because it formed a solid foundation for my assessment.*" (Participant 41).

Professional Responsibilities

About one-quarter of the TCs referenced topics related to professional responsibilities in their final blog posting. The following three themes were identified from the postings (Table 5).

Table 5. Professional responsibility themes for use of generative AI technologies

Theme	Quotation from final blog posting
Ethical use of AI	*AI is a tool that needs to be used wisely. If we are using it, we need to ask* technologies *the right questions, double-check its ideas and answers, and diligently ensure that they correspond correctly with the outcomes and meanings of our lessons.* (Participant 84)
Communication	*Editing Professional Communications: AI helped refine emails to professors, my practicum supervisor, my mentor teacher, school staff, and parents, ensuring professionalism and clear communication* (Participant 6).
Mentor-teacher collaboration	*My mentor teacher also provided me a few new resources, such as Magic School AI (2025), which is amazing! In return, I was able to teach her Canva (2025) and get her set up on a teacher account! It was great being able to share resources together and collaborate in the world of technology!* (Participant 76)

Inclusive Environments

There were only six TCs who made comments related to inclusive environment competency. All of them were related to using GAI to differentiate lesson plans for student learning. For example, "AI also supported my lesson planning by generating differentiation ideas for a Level 1 ELL (English Language

Learning) student and two students on the autism spectrum" (Participant 6). And, "I was also able to utilize AI applications when seeking support on the differentiation piece within my lessons. When a lesson was planned where differentiation was challenging, I often used these AI applications to seek a solution" (Participant 31).

Facilitation

Almost all of the final blog postings described how the TCs were using GAI applications outside of class time to support their teaching practice. There were only four TCs who commented on how they were using these applications during class with their practicum students. "I have one key example. While we were working on short stories as a class, I wanted to teach students about the importance of using rich and descriptive language pertaining to both characters and setting. I had ChatGPT (Open AI, 2025) create a list of rich descriptive vocabulary that we could inquire upon. I have included a picture of the list of adjectives that I used (Figure 2). The utilization of ChatGPT (Open AI, 2025) was perfect for this specific learning activity as I got to spend less time thinking of and writing adjectives on the board, which meant I had time to instead circle the classroom, interact with students, as well as ask and answer questions. I have included a photograph of our list of descriptive adjectives in this blog post" (Participant 7).

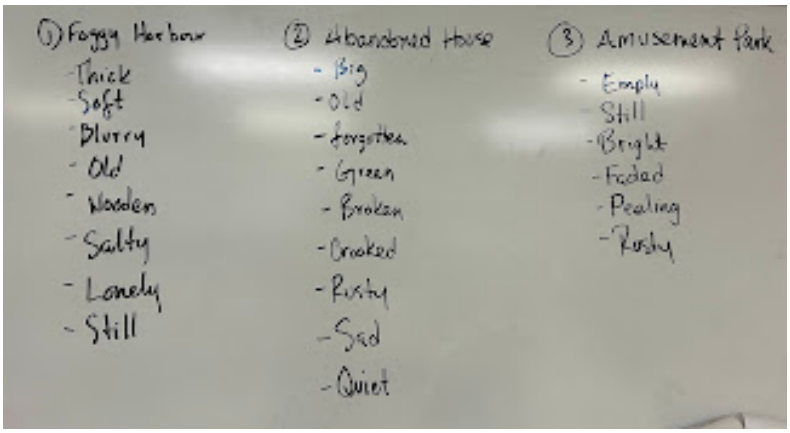


Figure 2. List of adjectives generated by ChatGPT (Open AI, 2025)

Another comment emphasized the co-learning that can take place in the classroom through the use of GAI technologies. "I taught my students how to responsibly research using ChatGPT (Open AI, 2025) and learned from them that you can ask the model to provide you with references for scientific and academic research" (Participant 32).

Follow-up Interviews

A total of six follow-up interviews were conducted with teacher candidates who had practicums in four different school districts. Three of the interviews were conducted virtually and recorded and transcribed using Google Meet (Google, 2025), while three other interviews were conducted in person and recorded and transcribed using Otter.ai (2025).

The first interview question asked the teacher candidates to expand on their use of generative AI applications in their five-week practicum. Two teacher candidates elaborated on their decision to intentionally not use these technologies during their practicum. "So, for me, using AI was a balance of two main things, which are my personal wellness and my growth and professional development as a teacher. I felt like I didn't necessarily want to rely on AI applications as a teacher candidate because I

wanted to become more proficient at lesson planning with my own ideas and thoughts before I started relying on AI. Also, I feel that, for me, the lesson planning process is part of the joy of teaching" (Interview B). "I know personally I was quite hesitant to approach it just because in my courses at Mount Royal University the rules are still a little bit different for AI, but my mentor teacher was an advocate for it. So, she showed me a few tools that I didn't use for practicum, but I had played with at home. And I'm starting to change my mind about it. I do see the benefit in some areas for it. She can't do everything in a day that she needs to do. So, it gives her that little one up for time management" (Interview E).

The other four teacher candidates interviewed described in more detail how they used GAI tools, primarily for planning and assessment purposes during their practicum.

Planning

> *My mentor teacher showed me some generative AI applications. There are some AI tools that you could use to help you with lesson plans. So, I was able to use AI tools, such as Diffit (2025). This is an AI tool for teachers, where you just put in a prompt and the tool will generate lesson content for you, as well as the appropriate level of text for the students*. (Interview A).

Two other teacher candidates explained how they used generative AI applications to create teaching resources. "*I think the main thing that I used AI for was making math questions because I taught sixth grade math, and so generating questions using AI made prepping lessons much faster*" (Interview C). And, "I *actually used quite a bit of it to make a lot of my study guides that I used for my practicum*" (Interview D).

Assessment

In terms of assessment, one teacher candidate spoke extensively about how she used GAI applications to create rubrics with student-friendly language.

> *So, one of the biggest learning curves for me during practicum was modifying my own language. I have a tendency of using more academic language, and I've never wanted to bring that down because I think that vocabulary exposure is really important for children, and when you hear it in use, particularly in the classroom, you're more likely to adopt it yourself. So, I like to use higher-level vocabulary with my students because it's that exposure for them that I think is important. Now, with that being said, in my assessment piece, I've realized very quickly that it's just not functional. It's not helpful for the students. And when we're considering assessment, that needs to be a piece that they can use. They have to be able to understand it. So, my initial rubrics and feedback were far too complicated. It was just not helpful for the students or for their families in terms of communicating how they were doing and their progress. So, I would actually use ChatGPT (Open AI, 2025) quite a bit because I would take rubrics that I had created or that I had made for myself, and I would ask it to put it into more student-friendly language and to try to help me make it into "I can" statements. So, I went from having these very comprehensive rubrics at the start of the term to really modifying them to be more student-friendly. I really depended on it because even for myself sometimes I don't know how to simplify my language for the students but ChatGPT (Open AI, 2025) sure can. And I'd be like, that seems so easy, but that would have taken me a half hour to figure out. So, with how intensive our five-week practicum was and the amount of time that I was putting into my planning, I just couldn't afford to add any other time in terms of a rubric, assessment, or my*

> *feedback. So, it was really helpful in helping me streamline that process and ensuring that I was giving quality feedback to the students*. (Interview F)

The second interview question asked the teacher candidates to explain how they learned to use GAI in their practicums. The majority responded that their mentor teachers were their primary learning source. For example, "*My mentor teacher is the one who explained to me how to use Magic School (2025*)" (Interview C). And,

> *My mentor teacher was really open and encouraged me to use AI applications. She mentioned that she had learned how to use them from some fellow teachers. Okay, so that information sharing is really vital. She's coming from this place of critical thinking that you can't do everything*" (Interview A).

One teacher candidate described how she

> *had a lot of conversations with my mentor teacher about AI usage. and she had some really positive things to say about it that I definitely feel I'll take into my future teaching practice, but I didn't necessarily want to use as a student teacher. She used ChatGPT (Open AI, 2025) and would do things like write a parent email with all the things that she wanted to say, and then she would say, "Okay, ChatGPT (Open AI, 2025), make this more professional.* (Interview B).

In addition, one teacher candidate explained how she learned to use GAI applications in the grade team meetings at her practicum school.

> *My mentor teacher and the grade seven and eight team were always working together, and then they'd also bring in other teachers to share ideas. So when I was learning about AI tools, it was in a room full of teachers, and one of them was like, try Microsoft Copilot (2025), which I had never heard of, and another of them said, just try ChatGPT (Open AI, 2025); just play with it a little bit and get more comfortable with it. They were always throwing out resources. So, the teachers themselves were my AI learning opportunity.* (Interview E)

At one practicum school, the teacher candidate indicated in the interview that an external consultant visited the school to provide support with a GAI application.

> *There was an individual that did come in, did go over the AI report card application, and he came twice. The first time was to show off the program and how it could be used, and he gave us time to play with the application, and he would later tweak things. So, we'd give feedback on the application, and then he would show up again to review the changes, and he was always available online for questions.* (Interview D)

And one teacher candidate explained how she taught herself how to use GAI tools during her practicum.

> *So, I'll be honest. My mentor teacher this year, she was a very, very veteran teacher. She'd been teaching for 20 plus years. She was self-described as not tech-friendly. She didn't know how to use technology. She often asked me for guidance on how to use technology. And even myself, I don't consider myself the most tech-friendly person either. I was trying to roll with it and fortunately our admin team did seem to be a bit better versed in it. So, they would try to disseminate information about AI tools, but I wouldn't say that it was a heavy focus or a big area of focus. I think that was definitely something that I learned from your class, to be honest, was to kind of try and be open to trying new technology tools. Up to this year, I've been not*

> *just resistant, but I would completely avoid AI because there was so much fear attached to it, and I was so fearful of my work being flagged for AI or any kind of form of AI that I would just avoid it entirely. So, this year I saw a big change in the university where we were kind of harnessing it as a tool rather than avoiding it as a form of cheating. So, I think that helped me change my mindset too in using it as a tool and realizing that it's not a way to cheat through your work, but it's a way to really help you make better work or create better work, I guess.* (Interview F)

The third interview question asked the teacher candidates to describe how they plan to use GAI applications in their future teaching practice. In all six interviews, the teacher candidates commented on how they planned to use these tools strategically in order to manage their workload and have a work-life balance. For example:

> *I think I'd still be using it the same way I do right now, where I use it to kind of help ease the workload. Especially for math problems, sometimes I have trouble coming up with questions, off the top of my head. ChatGPT (Open AI, 2025) can generate a bunch of randomized questions instantly. I check to make sure that the answers are fine, that takes a lot less time than me trying to come up with them myself, especially for things such as word problems. I probably wouldn't use it for the sake of creating lesson plans for me. I don't think I'm at a comfortable enough level to do that. That might change in the future, but right now, I like using it just to help ease my workload, using it as like a tool while I'm still in control of it.* (Interview D)

Another teacher candidate echoed these comments but emphasized the importance of developing her foundational teaching skills before relying on generative AI applications.

> *So, like I mentioned before, it's really important to me that I have those foundational skills as a teacher before I start relying on tools like this, and that's my personal choice. I don't necessarily think that's the right or wrong thing to do. I would definitely use AI for lesson planning, brainstorming, emailing parents, and things like that. I think sometimes as a teacher you can get caught up in spending a lot of time brainstorming, which can be great, but at the end of the day, you don't want to be at the school until 6 p.m. And work-life balance is really important to me. So, I see it as a tool to take off some of that extra mental load*. (Interview B)

Planning is a key teaching competency, but it can be very time-consuming. The following interview quotation demonstrates how one teacher candidate intends to use GAI tools to help her create mid- to long-range plans.

> *So, I think this year I became quite proficient at making these mid- to long-range plans. But sometimes when you're looking at mid- to long-range plans, you stumble a bit and you're like, "Gosh, okay, I get what I'm trying to do, my end point. This is my progression, but how the heck am I going to break this up into these lessons, into these steps? So, I could definitely see myself next year, creating these mid- to long-range plans and then having AI help me break it up into these small, manageable chunks and kind of, making almost like a draft of this is kind of the plan that I need to follow*. (Interview F)

One teacher candidate discussed how he could see himself using GAI applications to support his own K to 12 teaching practice in the future, outside of the classroom, but that he was not sure about student use in the classroom.

> *It's going to impact my future teaching practice in terms of lesson planning and assessment, not necessarily facilitating, because I think it still is a big test for teachers to do it in the classroom, and that's not something AI would do, but in terms of planning, I think AI is going to be a big part of that, just because new teachers need more supports, and I think those supports are valid to be placed. For instance, if you're teaching grade three and you don't know the words to say, I would definitely use Diffit (2025) in my future practice*. (Interview A)

A teacher candidate who did not use generative AI applications in her practicum because of lack of confidence. indicated that she is now learning how to use these tools in her Physical Education Program of Studies course.

> *I am currently using ChatGPT (OpenAI, 2025) for the gym class that I have now. For the PE class, we had to do an AI-generated lesson. So, I used ChatGPT (Open AI, 2025) for the first time, and I was impressed with how well it did at coming up with a lesson. I gave it the MRU lesson plan, and then I put in something for every part of the template. So, I got a pretty focused, specific lesson plan from ChatGPT (Open AI, 2025) with only a few entries, and it was free and easy to use. So, I definitely will use ChatGPT (OpenAI, 2025) in the future for planning.* (Interview C)

DISCUSSION

The findings are now discussed in relation to our Bachelor of Education's five teaching competencies:

1. Planning
2. Assessment
3. Professional responsibilities
4. Inclusive Environment
5. Facilitation

With regards to these teaching competencies, the final blog postings and follow-up interviews indicate that our teaching candidates were primarily using GAI applications to support their planning and assessment responsibilities during their 3rd-year practicum. They also indicated that they were using the GAI tools outside of the classroom to reduce their workloads and improve their work-life balance. This finding aligns with the research of others who have discovered that teachers currently use GAI to support lesson preparation and assessment (Duan & Zhao, 2024; Kong et al, 2024; Nazaretsky et al., 2022). At a local level, a Canadian Broadcasting Corporation (CBC) article describes how Connect Charter School in Calgary is "embracing artificial intelligence for report cards and lesson planning" (Zapata, 2025, n.p.). Baskara (2023) sums up this trend by stating that "the innate capability of generative AI to produce educational content autonomously, significantly reduces teachers' traditional burden of content creation and delivery (p. 413).

Conversely, as one teacher candidate wrote in his beginning-of-the-semester blog post, "With great power comes great responsibility... Of course, AI is useful. However, it needs to be used and taught with boundaries and respect" (Participant 68). In terms of the professional responsibilities' competency, the findings identified the themes of ethical use, communication, and mentor-teacher

collaboration related to the use of GAI. When the teacher candidates were further questioned about this competency in the follow-up interviews, all six of them admitted that they were not familiar with their practicum school or university guidelines about the ethical use of GAI. This finding resonates with a survey conducted by Barrett and Pack (2023) that revealed 95.6% of university educators reported having received no training on the ethical use of GAI in education. This survey result is concerning as Baskara (2023) emphasizes that ethical considerations arising from the incorporation of GAI in classrooms are only going to increase and thus, there should be increasing discussion and attention to the ethical use of GAI in teacher education programs. He goes on to state that:

> Data privacy, security, and algorithmic bias are pressing concerns. Their profound implications for the rights and welfare of students necessitate a conscientious examination and understanding of these complexities. As these dilemmas arise, teachers, the frontline users of AI in educational contexts, find their roles extending to include ethical mediation and digital stewardship. (Baskara, 2023, p. 416).

In terms of how GAI could support inclusive environments, the teacher candidate (TC) comments indicate that they used these tools to differentiate lesson plans for students in their practicum classrooms. One TC described how her mentor teacher introduced her to the Diffit (2025) application, which "supported my lesson planning by generating differentiation ideas for a Level 1 ELL student and two students on the autism spectrum" (Participant 6). Javed (2024) states that there is tremendous potential beyond just lesson planning to use GAI applications in combination with assistive technologies to provide exciting learning experiences for all students.

With regards to the facilitation competency, there were relatively few comments related to how students and teachers were using GAI tools during class time. A teacher candidate in an elementary classroom described how she used ChatGPT (OpenAI, 2025) with her students to create a list of rich, descriptive vocabulary words that they could then use in the creation of their short stories (Participant 7). And another TC in a junior high school placement described how he taught his students how to responsibly research using ChatGPT (OpenAI, 2025), and in turn they taught him how this application could provide references for scientific and academic research (Participant 32).

This lack of GAI use in the classroom is probably a reflection of our teacher candidates' inexperience as well as the fact that younger children are just beginning to be exposed to these applications, but rapid change is on the horizon. Burleigh (2025, March 10) describes how children in China, as young as six years old, are now taking classes in GAI in order to become future developers of applications such as DeepSeek (2025). And the Canadian singer-songwriter Grimes (Claire Elise Boucher) has partnered with a company called Curio to create Grok, an interactive AI toy aimed at young children, allowing them to chat with the toy, ask questions, and dive into imaginary play (Sehdev, 2023, December 22).

RECOMMENDATIONS

The final interview question asked the teacher candidates how the mandatory educational technology course could better prepare them to ethically and effectively use generative AI applications in their university practicums and future teaching practice. The following four themes emerged from an analysis of the interview transcripts:

1. Unpacking preconceptions and concerns about teaching with technology

2. Generative AI prompting
3. Developing a personal library or toolkit of generative AI applications
4. Focus on peer learning

Unpacking Preconceptions and Concerns about Teaching with Technology

Two teacher candidates in their interviews emphasized the importance of beginning the course by unpacking preconceptions and concerns about teaching with technology. For example:

> *I know a lot of other colleagues of mine do not feel the same way about Gen AI, and they're still not comfortable using it. So, I would recommend spending a little bit of time just talking about people's individual feelings about AI and why many of us may have that hesitation or aversion to using it in the classroom, just because I know there's a lot of people who feel uncomfortable using it. There were some of us that eased into it because we could see a purpose. And I feel like all of us have different views and uses for AI in the classroom; some of us may like to use it or not*. (Interview D)

A related interview comment indicated the importance of discussing both the opportunities and drawbacks of teaching with technology. "*I came into the course not really knowing anything about how to use technology effectively. So, I think even just more emphasis on how to use technology effectively, as well as talking about some ways that it's ineffective*" (Interview C).

A similar recommendation has been made by several other researchers who stress that it is important to identify what types of GAI anxiety exist among pre-service teachers who will be utilizing GAI in schools and then discuss strategies for how they can cope and potentially overcome this anxiety (Ayanwale et al., 2022; Hopcan et al., 2023). Some of the research about helping people overcome math anxiety can be applied to GAI anxiety. For example, the American Psychological Association (APA) recommends spotting the signs early and developing a growth mindset that involves a positive attitude and an open mind (Weir, 2023). As they say, "The mind is like a parachute; it only works when it is open."

Generative AI Prompting

Several of the teacher candidates commented in the follow-up interview about the importance of learning how to create good prompts in order to receive quality responses from generative AI tools. They provided ideas on how this should be incorporated into the educational technology course.

> *So maybe an area that we could work on more next year was how to create an effective prompt. What do we need to include in our prompts to help generate these ideas that are both authentic to us and our teaching philosophy and what we're trying to accomplish, but also work within the efficiency side. So, we don't want to spend too much time on these prompts, but they need to be to produce high-quality results. So, that could be maybe an area that we didn't really touch on this year that I think could be helpful for others*. (Interview F)

Also, the potential of having a guest speaker provide advice on generative AI prompting.

> *The one thing that I would say is that I felt like it would have been great to spend even more time chatting about AI and maybe even getting someone who is using it all the time and can give advice on how to prompt it*. (Interview B).

A report by MIT Technology Review Insights (2023) states that "Prompt engineering is crucial in generative AI because it directly impacts the quality and relevance of AI outputs by providing clear instructions and context, enabling users to effectively leverage AI's capabilities and achieve desired outcomes" (p.4). The AI for Education (2023) organization has developed a five "s" prompt framework for educators. The five "s" consist of:

1. Setting the scene—providing the AI chatbot context on what role, expertise, and/or environment it should use to guide its output.
2. Be specific in the instructions—clearly defining the task and providing details on what you would like included.
3. Simplify your language - use a conversational approach with simplified language that avoids unnecessary jargon.
4. Structure the output - tell the chatbot how to structure the output with specifics on format, audience, and/or sections.
5. Share the feedback - provide feedback at all points in the conversation. Share specifics on what needs to be revised to meet your needs.

Tassoti (2024) applied this five "s" prompt framework to a chemistry education course for pre-service teachers. His study found that teacher candidates initially struggled with the nuances of effective prompting, but the adoption of structured frameworks such as the five "s" model significantly enhanced their perceived quality of AI-generated answers. Tassoti (2024) recommends the use of educational frameworks to guide the effective and ethical use of GAI in teacher education programs.

Developing a Personal Library or Toolkit of Generative AI Applications

One of the teacher candidates described the importance of learning about a variety of GAI applications beyond just ChatGPT (OpenAI, 2025).

> *I think as always because AI is progressing so quickly and it's ever evolving. I'm sure that there's going to be new and better tools next year too. So maybe exploring some of the variety that's out there. I'm pretty stuck on Chat GPT because I'm familiar with it now, and I know how to use it, and I've always been pretty happy with the results because I think I'm good at making prompts.* (Interview F)

Another teacher candidate emphasized the importance of an experiential approach to learning in order to develop confidence with GAI tools.

> *I appreciate your course's hands-on approach because that makes you more comfortable with new technology and is a good stepping stone for someone like me who was terrified of AI. Technology isn't scary, so AI isn't scary. Maybe a block of class where the AI resources are maybe listed up and it's like, take an hour and format something about your favorite movie or your favorite topic and just play with it and get familiar with it because I think that would take the fear factor out of it a little bit too. I know there's only so much time in the program too, though*. (Interview E)

Summing up these comments, a third teacher candidate recommended that students should develop a personal library or toolkit of GAI tools in the educational technology course.

> *I would also recommend developing a library of AI tools. So, I know the math and science courses have an assignment where they generate a resource list. So, I think for your course,*

> *what could help teachers is to also generate a list so they can use it in the future. Just generate a list in your Professional Learning Plan (ePortfolio) tab or something like a general spreadsheet as an assignment, list out AI tools that you may use, and then, like, just curate it and see how you can use them*. (Interview A)

Focus on Peer Learning

One of the principles of Friesen's (2009) teaching framework is that teachers improve their practice in the company of their peers. A focus of our Bachelor of Education program is helping our teacher candidates develop their professional learning network (PLN), and the follow-up interview comments indicated that this collaborative approach should also be applied to learning about GAI applications. "I think I learned a lot from my peers in the educational technology class and also from sharing our assignments. For example, when we shared our Scratch coding lessons. I think learning from peers and doing more peer sharing with AI tools would be really helpful" (Interview C). This was further emphasized in another follow-up interview:

> *Another benefit was having people in the technology class with different levels and being able to connect with them and get help from them. I liked that part too. It brings out a different skill set that someone might have that they can kind of focus in on and show. And yeah, I think you should really push this further with AI tools next year*. (Interview E)

NEXT STEPS

Based on the recommendations from the follow-up interviews and the insights from the blog postings, the educational technology course is in the process of being redesigned to better prepare the teacher candidates to ethically and effectively use generative AI applications in their university practicums and future teaching practice. The focus will be on how GAI applies to all five of our teaching competencies. To enable this process, the redesign will include the introduction of a structured reading group activity and the co-creation of a generative AI in teacher education repository.

Structured Reading Group Activity

Two common challenges in any higher education course are getting students to complete course readings and having them engage in deep rather than superficial (scanning) reading. In a teacher education program, there is an additional challenge of getting the students to connect their readings to their field placement and practicum experiences. Parrott and Cherry (2011) have developed a structured reading group activity that can facilitate both deep reading and active discussion of course material. Early in the semester, students are assigned to small groups of five with a set of rotating group roles: discussion leader, passage master, creative connector, devil's advocate, and reporter.

We have adapted this activity to allow teacher candidates in the educational technology course to make intentional connections between readings and actual use of generative AI applications. The process will begin with a pre-class reading and response activity. Over a five-week period, the entire class will be provided with a reading linked to how generative AI relates to one of our Department of Education's five teaching competencies:

1. Professional responsibilities
2. Planning
3. Inclusive Environment

4. Assessment
5. Facilitation

Each student will be assigned a specific role in their small group each week. Students will then be responsible for completing the reading and posting a contribution to a discussion forum related to their assigned roles before class (Table 6).

Table 6. Structured reading group roles and responsibilities

Role	Responsibilities
Discussion leader	Your job is to review the generative AI reading and come up with two to three questions for the group. The questions need to capture the main points or takeaways. You will also guide the online and face-to-face discussions, which means keeping track of time and asking others to share their questions and insights from their own preparations. You will encourage critical discussion, respectful disagreement, and debate but work to keep the discussion on track. Probe with an open question such as "Can you tell us more?" or "Can you give a specific example?" or "Why?"
Passage master	Your job is to review the assigned generative AI reading and highlight two critical passages. These passages have caught your attention for some reason, such as they eloquently capture the main points, or they are confusing and/or contradictory. Although your preparation should include the page numbers and/or locations of the passages, it must also include brief summaries of the passages and more detailed explanations of why you wish to draw the group's attention to the passages.
Creative connector	As the name implies, you connect the readings to other ideas. These ideas can be social, political, or cultural. In Parrot and Cherry's (2011, p. 357) words, "this may include making connections to other reading assignments or artifacts in popular culture (advertisements, YouTube clips, cartoons, discussions of movies, etc.)." Some examples are a particular episode of The Big Bang Theory, a popular internet meme, a magazine ad, a TED talk, a personal photograph, a famous work of art, a familiar building, and a Disney character. It can also be a personal connection: something that happened to you as a child, a favourite saying of an elderly uncle, et cetera. Post your idea to the discussion forum. You need to include enough details for your group to understand the connections that you are making.
Devil's advocate	In this role, you act as a critic. Develop a list of questions that challenge or poke holes in the main theories, ideas, and examples presented in the reading. Is there another side to the story? Are competing interests presented fairly? Which questions are left unanswered? What are some differing ideas or competing theories? Whose voices or experiences are not included? How does this stack up with historical practice? What are the pros and cons of the arguments presented? This role gives students explicit permission to disagree with the course material and to develop arguments contrary to popular opinion. Use one or two of these questions to guide your contribution.
Reporter	In this role, you have a laptop and take notes on the group discussion in a collaborative application such as Google Docs (Google, 2025). This online and face-to-face discussion synthesis includes both points of general agreement and especially points of contention or disagreement. Highlight critical elements examined and sum up main points discussed. Find internet links for connections brought up as part of the discussion and include them in the discussion summary. Note points of confusion, areas for future study or particular areas that students found interesting. You might also be asked to report back verbally to the entire class.

During class, teacher candidates will be given approximately 20 minutes to meet in their structured reading groups. They will discuss, debrief, and synthesize how the assigned generative AI reading corresponds with their field placement and practicum experiences. The reporters will be encouraged to create their discussion summaries in a collaborative application such as Google Docs (Google, 2025) so that these summaries can be linked and accessed by other students in the course learning management system. Each week, one group will be selected to provide an oral report of their discussion summary during class time.

After class, each teacher candidate will be required to post a reflection on the online discussion forum about how the use of generative AI applications in their field placements relates to the teaching competency highlighted in the reading.

Co-creation of a Generative AI in Teacher Education Repository

Generative AI applications are being developed almost on a daily basis, and it is very easy to become overwhelmed by the constant stream of information and resources. Thus, rather than having each student build their own personal library of generative AI tools, we recommend a collaborative approach where the entire class creates a single repository. As they say, "many hands make the work lighter," and we have used Google Sites (2025) to develop a framework for a Generative AI in Teacher Education repository where students throughout the semester can add and curate generative AI tools, resources, and readings using the five Mount Royal University Department of Education teaching competencies:

1. Professional responsibilities
2. Planning
3. Inclusive Environment
4. Assessment
5. Facilitation

CONCLUSION

As mentioned in the introduction, the general public only began to use generative AI tools in the fall of 2022. Thus, in essence, we are all first-generation users of these applications, which means there is tremendous potential for co-learning between students and teachers regarding how to use these tools effectively and ethically in educational contexts. Two quotes from this study that highlight this collaborative approach to learning, including one from a teacher candidate and mentor-teacher partnership:

> *My mentor teacher also provided me with a few new resources, such as Magic School AI (2025), which is amazing! In return, I was able to teach her Canva AI (2025) and get her set up on a teacher account! It was great being able to share resources together and collaborate in the world of technology!* (Participant 76)

The other quote demonstrates a learning partnership between a teacher candidate and his junior high school students for using generative AI applications. "*I taught my students how to responsibly research using ChatGPT (Open AI, 2025) and learned from them that you can ask the model to provide you with references for scientific and academic research!*" (Participant 32).

The other conclusion from this study is the importance of teacher candidates developing a lifelong learning mindset when it comes to the use of GAI tools. Baskara (2023) states that with the rapid pace at which technology evolves, educators must constantly update their knowledge and skills, aligning their teaching practices with the latest developments in GAI and other ed-tech tools. He adds that "Teacher education programs, hence, need to instill in their students an intrinsic motivation for continuous professional development, enabling them to stay abreast of technological advances and seamlessly integrate them into their teaching" (p.4 16).

Finally, this study has demonstrated to us that the growing importance of GAI in teacher education means that it needs to be dealt with at the program level rather than just in a single educational technology course. For example, ethics courses, case studies of AI use in educational settings, and guided discussions on potential GAI scenarios need to take place throughout the program. As educators and researchers, we must navigate the evolving landscape of GAI integration in education with a sense of balance - harnessing the benefits of technological advancements while ensuring the human essence of teaching and learning remains intact. Through this delicate balance, we can truly shape a future of education that serves both individual learners and society.

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Mobilization through Digital Social Networks for the Professional Development of Higher Education Academics: A Collaborative Construction on the OBSERVA Portal

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ABSTRACT

Higher education academics face increasing pressure to adapt to emerging technologies and new pedagogical practices, yet often lack adequate support for professional development. In response to this context, the OBSERVA project - launched in Brazil in 2014 - established an online portal aimed at supporting the exchange of teaching practices among university educators. This study builds upon the OBSERVA initiative by examining the potential and limitations of using digital social networks to support academic development through the collaborative sharing of classroom experiences. Adopting a phenomenological approach, the research explored academics' experiences with digital networks in their professional practice. The methodological design comprised six phases: (1) pilot interviews with 12 of 117 participating academics; (2) initial content development for the OBSERVA portal and associated networks; (3) selection of 10 academics with innovative practices; (4) delivery of live broadcasts; (5) follow-up interviews; and (6) online publication of the resulting content. The findings suggest that while academics are generally familiar with social networks in their personal lives, their use for pedagogical professional development remains limited. Participation in the live broadcast sessions encouraged critical reflection and professional learning among contributors. The initiative reached audiences in ten countries, underscoring the need for more structured content production processes in educational settings. In response, two resources were developed: a Good Practices Guide and a Guide for the Collaborative Production of Digital Pedagogical Content, both designed to strengthen the role of social networks in academic professional development.

Keywords

digital social networks; pedagogical professional development; higher education; networked communication; digital media.

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INTRODUCTION

The professional development of academics in higher education is often an individualised process, stimulated by isolated and decontextualised pedagogical training sessions (Correia & Alves, 2022). This traditional approach, focused on solitary work, faces resistance to proposals for change, both from academics who affirm the private nature of their practice (Dana et al., 2021; Quinn, 2012), and from students who may reject innovations for fear of increased academic demands (Calleja & Buhagiar, 2022). Despite this landscape, collaboration and joint reflection emerge as elements highly valued by academics themselves, who demonstrate appreciation for moments of exchanging experiences with their peers (Meyer et al., 2018; Pires & Rodrigues, 2023).

The need to create contexts for the sharing of practices and materials is, therefore, fundamental to driving innovation and professional development (Myllykoski-Laine et al., 2023; Patterson, 2024). In a world marked by rapid social transformations, the use of digital technologies and peer collaboration are essential strategies (Guo, 2013; Hedberg, 2008; Pischetola et al., 2023). In this context, Digital Social Networks (DSNs) emerge as a promising alternative. With over 170 million active users in Brazil (We Are Social; Meltwater, 2023), DSNs represent viable spaces to promote continuous, reflective professional development that integrates formal and informal learning (Schneider, Gonçalves, et al., 2023).

Although not originally designed for educational purposes, Digital Social Networks (DSNs) can support the professional development of academics (Abdallah, 2018; Carpenter et al., 2017), by facilitating collaboration and the exchange of knowledge (Leite et al., 2020). This potential aligns with the understanding that education is not a unidirectional process but rather occurs through dialogue, exchange, and collaboration (Freire, 2019). However, their use is not without its challenges. The literature points to the dual nature of DSNs, highlighting both their benefits, such as collaboration (Allela et al., 2020), and negative aspects, like anxiety and procrastination (Aragão, 2017). A critical gap in the research is that many studies frame DSNs simplistically - as either good or bad - and focus predominantly on the lecturer-student interaction. Few investigate the potential of DSNs for peer-to-peer professional development in higher education, revealing the need for more nuanced and contextualised research.

In addition, studies have shown that the initial stages of technology integration into teaching and professional development often increase academic workload, especially for those still developing digital competencies (Carnicer, 2021; Gregory & Lodge, 2015). Learning to navigate new platforms, adapt pedagogical approaches, and engage with unfamiliar tools can be time-consuming and cognitively demanding, frequently requiring additional institutional support and time allocation.

The COVID-19 pandemic acted as a catalyst for technology adoption, reconfiguring higher education (Gatti, 2020) and forcing the search for new ways of "doing" education. Academic staff began using DSNs, such as WhatsApp, to connect with students (Instituto Península, 2020), showcasing an

emergent technological appropriation. This landscape spurred the evolution of the Portal OBSERVA project. Created in 2014, the portal was originally founded on research into the needs of academics, which established its principles for sharing based on storytelling and peer validation (Lowenthal, 2008; Meyer & Vosgerau, 2018; Vosgerau & Meyer, 2023). Initially, the project operated with studio recordings where the academic's role was partial. The pandemic made this model unfeasible and revealed the need for new paths, causing the project to migrate to live broadcasts on multiple DSNs (Facebook, Instagram, YouTube), transforming itself into a dynamic space for shared content production.

Given this scenario, the objective of this research is to analyse the possibilities, challenges, and implications of using digital social networks to drive the shared process of content production for the Portal OBSERVA, as a means to foster professional development of academics in higher education.

PROJECT BACKGROUND

The Portal OBSERVA project was initiated in 2014 to address an issue in academic professional life, where effective teaching practices developed by individuals often remain unknown to the wider community. The project was based on the premise that a space for sharing these practices could function as a collective resource for professional development, and that the portal could be a “modern toolbox” (Meyer et al., 2015). In this sense, the portal is designed to be an instrumental resource, providing a place where academics can select elements they find useful for their own classroom activities, such as methodological guidance, lesson models, and exemplary practices.

The portal’s design was developed from a doctoral research study (Meyer & Vosgerau, 2018) which sought to answer the question: "What concepts, definitions, and propositions should guide the design of a portal to contribute to the professional development of teaching in Higher Education?". Adopting a Grounded Theory approach, the research was built directly from the perspectives of 32 higher education academics, whose needs, desires, and limitations were captured through in-depth interviews and participant observation.

This research generated the theoretical model that now serves as the portal's foundation. The model is built upon a core set of guiding principles, derived directly from the academic community it is intended to serve. These principles are: Facilitating Collaboration - Research indicated that while academics value collaboration, it is often restricted by factors such as a lack of trust in peers, insecurity, and fear of negative criticism. The portal is therefore designed as a structured environment intended to facilitate what the research termed "comfortable collaboration"; Purpose-Driven Content - academics expressed a clear need for a resource that serves as a reliable source of information, a place for research, and a repository of practical examples. The portal’s purpose is to provide precise information that supports both declarative learning (what to know) and procedural learning (how to do it); specific and curated resources - to meet the practical needs of busy academics, the portal focuses on specific, high-value resources. These include brief, informative videos, concise texts, and practical teaching plans. All content undergoes a process of professional curation to ensure quality and relevance; a "How-To" approach based on Storytelling -: the preferred method for sharing, as identified in the research, is through authentic stories of practice. The portal uses a Digital Storytelling format, which includes the academic's own narrative (Relato), a step-by-step guide and student feedback to provide a holistic view of the practice and its impact; foundational pillars - underpinning the entire project are two non-negotiable principles demanded by the academic community: every piece of

content must have scientific validation to ensure its credibility, and the portal itself must be strongly structured for easy navigation, consultation, and use (Vosgerau & Meyer, 2023).

While these foundational principles established the portal's core identity, the project's evolution was significantly influenced by the digital transformation accelerated by the COVID-19 pandemic. The initial model of sharing via studio recordings became unfeasible, prompting a necessary pivot to live broadcast on Digital Social Networks (DSNs). This practical shift from a static repository to a dynamic, interactive space means the project now operates within the complex ecosystem of social media. To properly analyse this current phase of the project, it is therefore essential to establish a theoretical framework grounded in the concepts of networked communication, education in the digital age, and the specific affordances of DSNs for professional development.

THEORETICAL/CONCEPTUAL BACKGROUND

Resulting from technological advancements and the emergence of the internet, the term “network society” appeared in the late 20th century to represent a period in which information became a determining factor in society. This social organisation is characterised by the large-scale, decentralised, and real-time global circulation of information (Castells, 2020). Unlike mass media, where a single sender transmitted information to a large audience, the internet expanded the possibilities for communication. The individual moved from a passive role as a receiver of information to an interactive one (Barichello & Carvalho, 2013).

A practical example of this interactivity can be seen in posts on Digital Social Networks (DSNs). Any person with a profile on a DSN can be a content producer, and another individual can interact with that publication or create a new message from it. Jenkins (2009) conceptualises this phenomenon as convergence - the intersection of media from which new meanings emerge. While DSNs enable a greater volume of information to circulate globally, the challenge lies in transforming this information into knowledge. In an educational context, knowledge is understood as the development of a reflective competence regarding information, relating it to previously acquired knowledge and connecting it to daily life (Coutinho & Lisbôa, 2011). In response to this, Gomez (2004) proposes the concept of Networked Education, which consists of education that occurs in cyberspace, using available technological resources to promote collaborative educational processes.

The challenge presented by digital culture involves innovating practices through the use of digital technologies, which presupposes academic professional development. Innovation occurs through a continuous movement of appropriation, re-signification, engagement, cooperation, and collaboration. By engaging in social and pedagogical practices mediated by digital technologies, academics not only adapt these technologies to their realities but also promote changes within themselves in a dynamic and transformative process (Riedner & Pischetola, 2021). This calls for a pedagogy that can address contemporary cultural and social changes to promote networked teaching and professional activity. With this goal, Gomez (2015) developed the "pedagogy of virtuality," a proposal for open, dialogic, and horizontal education that connects beyond university walls. According to Gomez (2010), DSNs are a feature of the contemporary school that requires guidance and care to become an effective pedagogical device. Within an educational context, they permit the sharing of experiences and knowledge through dialogue (Schneider, Vosgerau, et al., 2023).

The main benefits of DSNs for academic professional development include: ease of access with lower costs for content production and sharing (Braga & Martins, 2020); the reduction of time and space

barriers; a high capacity for content storage (Kelly, 2019); the potential to reach a large number of people; and the inclusion of multiple voices from different cultures and experiences (Boholano, 2017). Furthermore, aspects such as the development of autonomy and self-regulation (Abdallah, 2018), the creation of communities based on common interests, peer collaboration (Boholano, 2017), and a high degree of interaction (Carpenter et al., 2017) make DSNs a space with potential for professional development.

However, it is necessary to highlight the challenges associated with these platforms, beginning with the need for digital inclusion and the development of technological skills (Gomez, 2010). The lack of depth and superficiality of content (Dogan & Gülbahar, 2018; Santoveña-Casal & Bernal-Bravo, 2019) can also present difficulties. Academic procrastination resulting from the misuse of DSNs can also hinder the professional development of academics in these spaces (Aslan Efe & Efe, 2018), which demonstrates the importance of training academics in the use of these platforms and the need to produce qualified content. Another issue to note is the algorithms that guide DSN use, which consist of data collection systems that determine which publications are delivered to more or fewer people (Baker & Hawn, 2022; Dhakal, 2025; Kaufman & Santaella, 2020; Schneider, Vosgerau, et al., 2023).

A theoretical approach that aligns with the use of DSNs for academic professional development is lifelong learning (LLL) (Fischer, 2000), which is also closely linked to networked educational processes. Systems that support it, such as DSNs, should allow the end-user (in this case, the academic) to become a co-developer, inserting their own educational context, prior knowledge, and goals. As a way of promoting LLL, Fischer (2000) highlights the importance of self-directed learning. In it, knowledge must be directed towards something that is useful in the academics' practice, since the motivation to learn, as well as adherence to programmes, must come from them.

Another type of learning that aids in the promotion of LLL is microlearning (Allela et al., 2020), which is an approach focused on providing small units of content that can be easily consumed in short periods of time. Finally, Fischer (2000) notes that LLL occurs in daily life through the resolution of real conflicts and reflection on failures, in a process he calls "reflection-in-action". One strategy to promote this reflection is digital storytelling (Lowenthal, 2008). This implies, for the author, telling their story, and engaging in reflective practice by transforming tacit knowledge - which comes from a subject's experiences or contexts - into a multimedia product, throughout the entire process of thinking, planning, and producing the digital narrative (Londoño-Monroy, 2012). On DSNs, digital storytelling can occur through posts that incorporate text, photos, and videos. A tool that contributes to this process is the live broadcast on DSNs. The main potential of live broadcast for education lies in the possibility for synchronous engagement and interaction, and the sharing and liking features that enhance content dissemination (Almeida & Alves, 2020).

In summary (as presented in Figure 1), academic professional development through DSNs can be supported by a lifelong learning approach, recognising that to teach, one must also acknowledge that there is still much to learn. Strategies for this promotion in digital spaces include self-directed learning and microlearning, which accommodate the routines of academics, as well as the use of digital storytelling as a means for academics to reflect on and reinvent their practice.

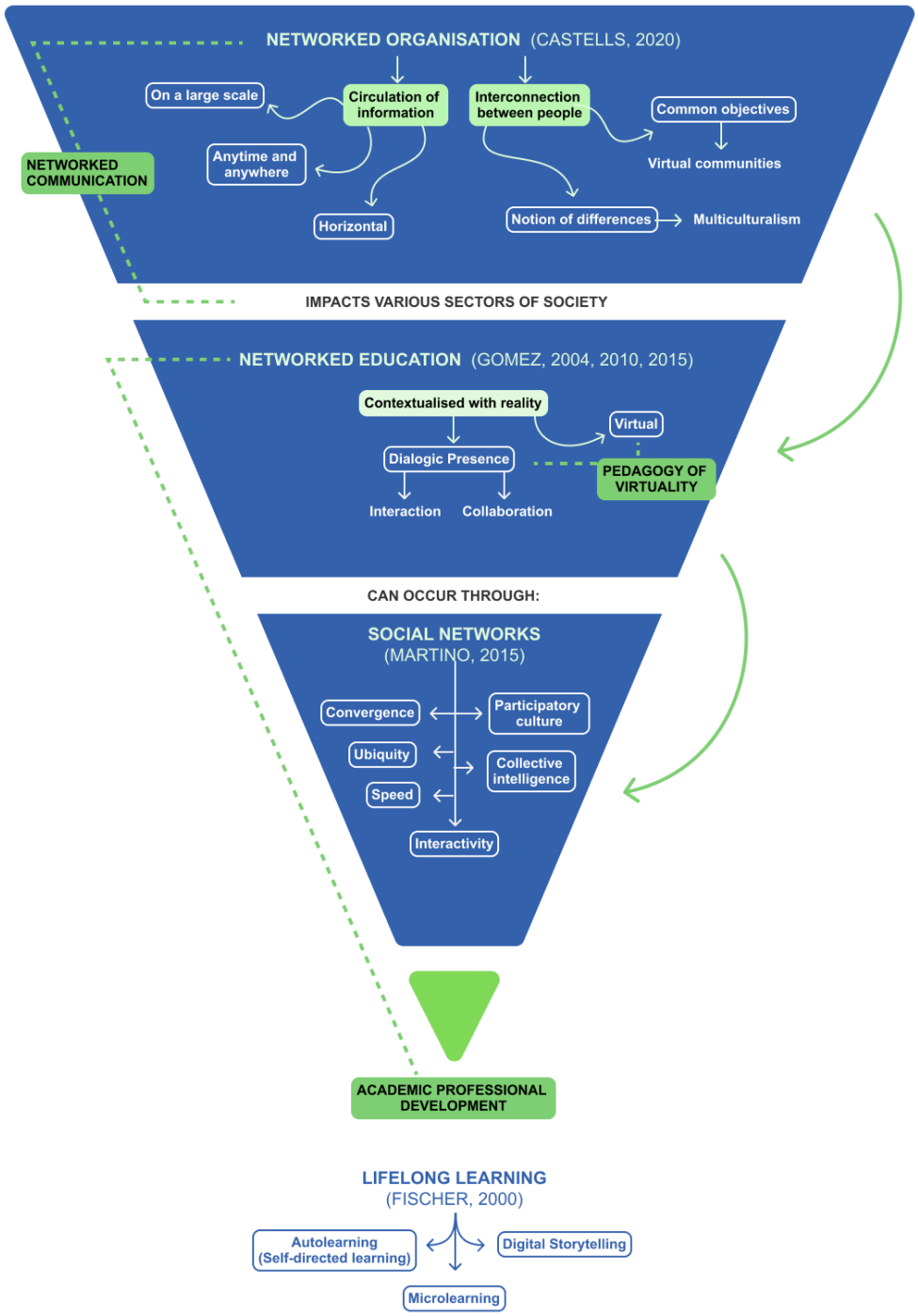


Figure 1. Research Framework ©The Authors

METHODS

Research Method

Adopting a phenomenological approach grounded in the phenomenology of perception (Merleau-Ponty, 1958), this research aims to explore and lend meaning to a specific phenomenon (Melo et al., 2018). The phenomenon analysed is the experience of higher education academics as they participated in a professional development proposal that utilised digital social networks to drive the shared process of content production for the Portal OBSERVA.

Research Design Model, Data Collection Tools, Recherche Participants and Recherche Procedure

The research design is directly integrated with the portal's content production workflow. As illustrated in Figure 2, the data collection tools are not separate instruments but are embedded within the production process itself.

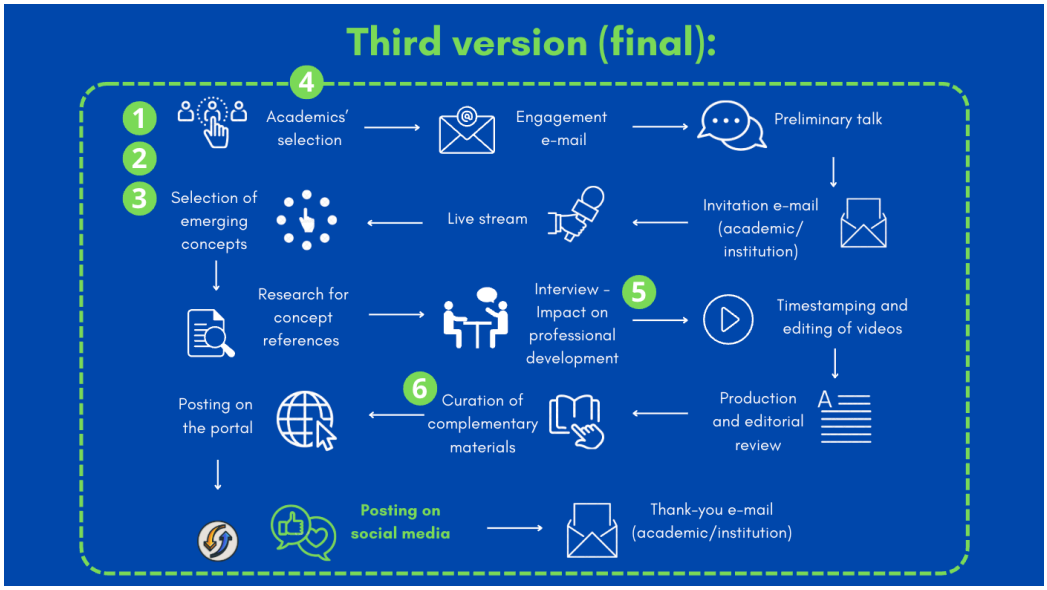


Figure 2. Research Design and Production Process ©The Authors

The first three phases occurred before the production process.

Phase 1. Pilot interview, served as a pilot stage, involving non-live online interviews with four volunteer academics from the institution. This phase was designed to refine the procedure for the live broadcasts, allowing the researcher, who was also the interviewer, to anticipate and mitigate potential issues.

Phase 2, Portal Production Process Definition, utilised the findings from the pilot interviews to establish the necessary stages for the collaborative production workflow. This workflow is subsequently described as one of the research results.

Phase 3, Identity Creation, involved the development of a new visual identity and a redesign of the Portal OBSERVA, which were necessary to align the portal with its presence on Digital Social Networks.

Phase 4, which occurred in the “Academics’ selection” stage, used a questionnaire to recruit academics from various institutions for the live broadcasts by asking them to describe an innovative practice and their social media use. From the 117 responses received, 40 participants completed the form correctly and accepted the Consent Form and six participants were selected for the interviews based on the criteria for good practice in higher education developed by Meyer et al.(2023).

Phase 5, 'Interview – Impact on professional development', took place following each live broadcast and had a dual purpose. Firstly, it served as a collaborative curation session, where key concepts that emerged from the academics' discussion were reviewed to guide the production of the video and web text for the portal. This stage also functioned as a professional development opportunity, in which relevant articles and theories were shared with the participant to connect their practice to academic literature. Additionally, this post-live stream interview was structured with specific questions to assess

the impact of the live broadcast and the shared knowledge production process on the academics' motivation for professional development.

Phase 6, 'Publication Validation', is a data collection stage that occurs after the production and curation of the video, text, and complementary materials, but before the final content is published on the portal. This phase used the post-interview reflection form to obtain the academic's final validation of the produced content and to formally request their authorisation for publication. Concurrently, the form collected final reflective data on the participants' experience, their awareness of the educational concepts they employed, and the perceived impact of the process on their professional development. Publication only proceeded after this validation and authorisation were secured.

Validity and Reliability Measures

To ensure the trustworthiness of the findings, several validity and reliability measures were integrated into the research design. A pilot study with four academics was conducted (Phase 1) to refine the research procedures and mitigate potential issues. Participants were then selected using purposive, criteria-based sampling (Phase 4) to ensure their high relevance to the phenomenon being studied. Credibility was enhanced through two distinct stages of member checking: a collaborative curation interview after the live broadcast (Phase 5), where emergent concepts were reviewed with participants; and a final validation form (Phase 6), which secured participant approval of all produced content before publication. Finally, data triangulation was achieved by collecting information from multiple sources for each participant, including the live broadcast interview, the curation interview, and the final reflection form.

FINDINGS AND DISCUSSION

Use of Digital Social Networks By University Academics

Figure 1 illustrates the profile of the research participants. Of the 40 participants, 34 (85%) already used Digital Social Networks (DSNs) for educational purposes. The predominant profile within the group consisted of academics in the 40–49 age range (12 participants), those with 1–5 years of professional experience (13 participants), and those with a 36–40-hour work week (11 participants).

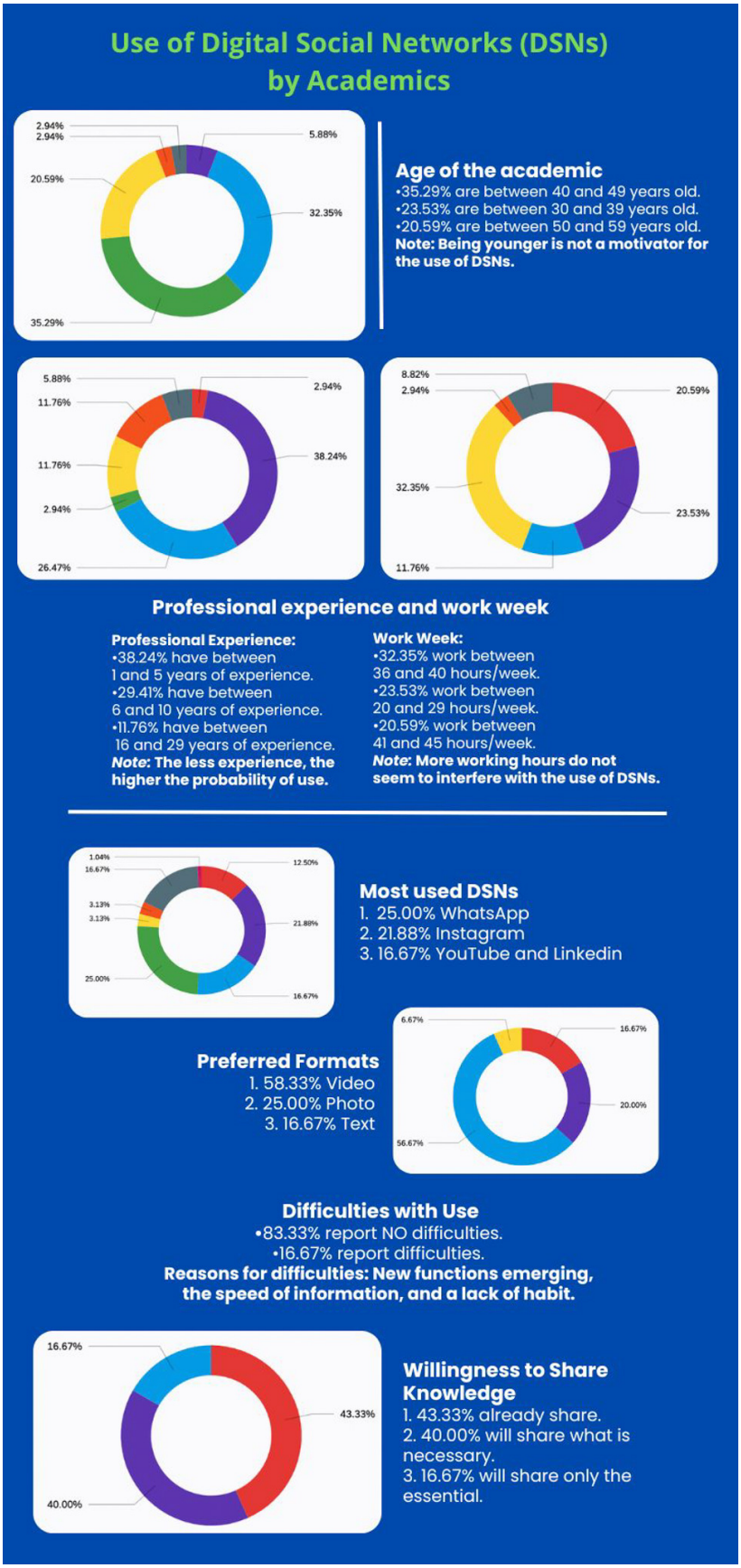


Figure 3. Profile of the participants ©The Authors

The most frequently used platforms were WhatsApp, Instagram, YouTube, LinkedIn, Facebook, Telegram, and Twitter, with video being the preferred content format (17 participants). The majority of respondents (25) reported no difficulties in using DSN interfaces and demonstrated a strong willingness to share knowledge: 13 stated they already do so, and 12 indicated they would share what was necessary.

Systematisation of Processes: Transposition From DSNs to the OBSERVA Portal

The production of educational content for Digital Social Networks (DSNs) is a complex process that requires rigorous planning to avoid superficial approaches (Dogan & Gülbahar, 2018; Santoveña-Casal & Bernal-Bravo, 2019) and to ensure quality academic professional development. To address this complexity, a production flowchart based on the methodological principles of Vosgerau e Meyer (Vosgerau & Meyer, 2023) was developed. The final version of this flowchart, which resulted from the present study (see Figure 2), structures the process from the selection of academics and the execution of live broadcast, through impact assessment interviews, to the final production of content for the portal and social media.

Content production involves a collaborative team of post-doctoral researchers, doctoral candidates, master's students, and undergraduate and secondary school students participating in a Brazilian scientific initiation programme. This collaboration is based on the 'student as partner' model, which views students as active contributors to the academics' own professional learning (Healey et al., 2014; Matthews et al., 2018). Responsibilities are delegated as follows: keywords are generated by all research group members and validated by doctoral and master's students in education; reference research and text editing are handled by undergraduate students in Languages; and video production is conducted by secondary school students, with support from master's and doctoral students.

The questionnaire used in the Academics' selection" stage, which identified how academics use DSNs, also guided strategic decisions for the Portal OBSERVA's online presence. The platforms most frequently used by the participants—Instagram, YouTube, Facebook, and LinkedIn - were therefore selected for the project. A Twitter profile was also created based on international research suggesting its use for professional development through microblogging (Abdallah, 2018; Bener & Yildiz, 2019; Carpenter et al., 2017; Santoveña-Casal & Bernal-Bravo, 2019). However, this platform was later discontinued due to low engagement, a finding consistent with the questionnaire data showing it was the least used platform by the participating academics. Furthermore, the questionnaire revealed that video and photo were the preferred content formats; consequently, these were prioritised in the portal's social media posts.

The creation of DSN content was also underpinned by theoretical pillars from this study's literature review. Concepts such as lifelong learning (Fischer, 2000), self-directed learning (Allela et al., 2020; Fischer, 2000), and digital storytelling (Çetin, 2021; Londoño-Monroy, 2012) formed the basis for the posts to motivate academics to engage to Portal OBSERVA. These concepts align with a microlearning approach, which is well-suited to the nature of DSNs (Salinas & Marín, 2014), as these tools are characterised by quick access, use in any time or space, and the promotion of user autonomy (Abdallah, 2018; Braga & Martins, 2020; Kelly, 2019).

Another practical application of this research emerged from the preliminary talks with academics. Some participants expressed insecurity about being in a live broadcast. In response, and to minimise potential errors, a 'Guide to Good Practices for Live Broadcast was developed. This guide includes

technical advice (e.g., ensuring a quiet, well-lit environment), content guidance (e.g., grounding statements in data), and delivery tips. The development of this material addresses the need to foster digital literacy among academics (Gomez, 2002), acknowledging that technological proficiency is not innate and that training is necessary for professional use (Bortolazzo, 2012).

Impact on Academic Professional Development

Access data from the Digital Social Network (DSN) platforms of the Portal OBSERVA revealed significant geographical reach, with users not only from Brazil - primarily from Curitiba, Paraná - but also from several other countries. Facebook recorded visits from the United States, Australia, and France; Instagram data indicated users from Germany, Ecuador, Nigeria, and Portugal; and LinkedIn extended the project's international audience to five additional countries. This widespread engagement illustrates the ubiquity of DSNs, which allow access at any time and from any location. Such large-scale reach has transformed modes of communication and human interaction (Castells, 2020; Levy, 1999), enhancing the circulation of information and expanding opportunities for engagement beyond one's immediate social circles (Castells, 2020). The presence of individuals from diverse backgrounds also fosters intercultural interaction and the collective construction of knowledge (Boholano, 2017; Gomez, 2004; Martino, 2015).

In addition, live broadcasts on DSNs significantly increased traffic to the Portal OBSERVA website, with peak activity recorded during each event. These results reflect the logic of media convergence (Jenkins, 2009), where content shared on DSNs motivated educators to access the portal for more in-depth material.

Beyond audience reach, qualitative data from post-live interviews indicated concrete effects on academic professional development. As summarised in Table 1, seven key areas of impact emerged: (1) reflection on practice, (2) collaboration, (3) theory–practice integration, (4) professional recognition, (5) interaction, (6) motivation, and (7) collaborative production.

Table 1. Aspects of Academic Professional Development

Aspect	Academics	Quotation Example
Reflection on practice	P1, P2, P3, P4, P7, P9, P10	"We always learn something when we share a bit of what we know."
Collaboration	P2, P4, P5, P7, P8, P10	"I was excited to collaborate on such an interesting project that could benefit colleagues nationwide."
Theory–practice integration	P3, P4,P6, P7, P8, P9	"I learned about the meaning behind what I was saying... it had structure and logic that wasn't just intuitive."
Professional recognition	P1, P4, P5, P6, P10	"I felt honoured and happy to know that what I do can contribute."
Interaction	P1, P9	"I really enjoyed it - there was attentive listening and good questions, and I was able to reflect on my practices."
Motivation	P2, P10	"I didn't get a new insight for my methods, but I felt energised and inspired to continue our work."

Collaborative production	P5, P7	"I said, 'Can I make a few suggestions?' And you said yes - so I contributed to the text."
Transformation of practice	P6	"I felt part of a wider transformation in higher Education - we need to move beyond content transmission."

These findings demonstrate that participation in the initiative prompted reflection on teaching practices, encouraged peer collaboration, and strengthened links between practical experience and educational theory. Many participants expressed a sense of professional recognition and motivation through their involvement, often describing the experience as both empowering and intellectually stimulating. The process of collaborative content production also emerged as significant, with participants noting opportunities to co-create, revise, and validate materials in dialogue with the research team.

The live broadcast also served as a catalyst for deeper pedagogical reflection, particularly when accompanied by digital curation of concepts. By linking personal narratives to academic literature, the project encouraged educators to evaluate their methodological decisions - many of which were previously made intuitively (Semingson et al., 2019). As P2 observed: "I consider it high-quality material, with strong dissemination potential, collected ethically and carefully." In this context, academic P3 illustrated the notion of media convergence as defined by Jenkins (2009): "I had the opportunity to share the material through my institution's channels - it gave visibility to my work." This ability to extend educational practices beyond institutional boundaries was echoed by other participants and illustrates how DSNs can amplify the impact of pedagogical initiatives.

At the same time, several participants raised concerns about their ability to use DSNs effectively. Academic P8 expressed hesitation in adopting such tools, stating: "I'm a bit hesitant... I think it's a generational and personality conflict." This highlights the broader challenge of digital inclusion and the ongoing need to support the development of educators' technological skills (Gomez, 2010).

Another critical issue that emerged was work overload, particularly during the initial stages of adopting digital platforms for professional or pedagogical purposes. Participants highlighted the additional effort required to prepare materials, learn new tools, and maintain regular teaching responsibilities. As P7 put it: "Those who spend too much time on social media have no time; those who work don't have much time either - this is exhausting work. You would need a whole dedicated department just for that. There's no way we can keep up like this." Similarly, P8 shared: "I don't have time to prepare. I do some research, but in reverse - against the grain of formal academic processes." These accounts align with research showing that technology integration, especially in the absence of institutional support and structured workload adjustments, can intensify academic labour (Carnicer, 2021; Gregory & Lodge, 2015).

Despite these challenges, DSNs were also seen as valuable tools for supporting microlearning and self-directed learning, offering flexible modes of professional development more compatible with the time constraints of academic life (Fischer, 2000; Salinas & Marín, 2014).

Finally, the project not only promoted reflection and learning but also contributed to professional visibility. Some participants reported receiving awards after documenting and sharing their practices,

reinforcing the potential of DSNs to foster recognition and strengthen academic identity in higher education.

CONCLUSION, IMPLICATIONS AND SUGGESTIONS

This study sought to examine the possibilities, challenges, and implications of using digital social networks (DSNs) to support the professional development of higher education academics through the collaborative sharing of classroom practices on the OBSERVA Portal. The results revealed that DSNs hold considerable potential as spaces for reflection, visibility, and interaction among peers, especially when their use is supported by structured processes and institutional encouragement.

Figure X offers a conceptual synthesis of the main findings by illustrating the intersection between the possibilities and challenges associated with DSN use, and the resulting implications for academic professional development.

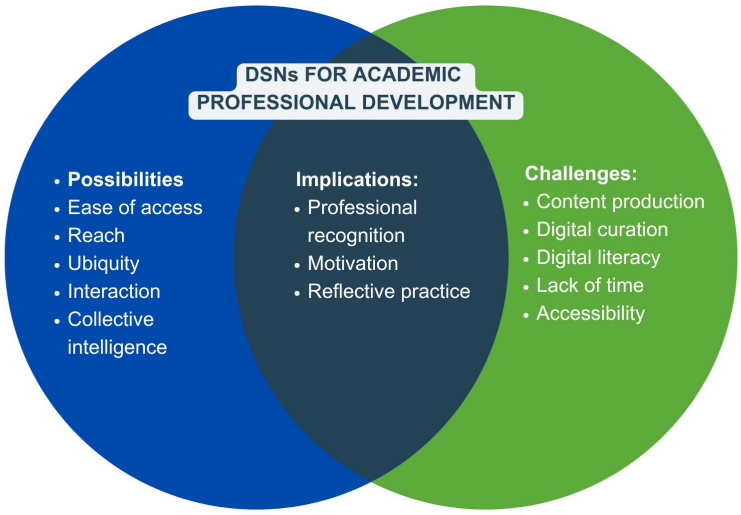


Figure 4. DSNs for Academic professional development ©The Authors

On the left side of the diagram, the possibilities include ease of access - since many academics already use DSNs and feel comfortable navigating them; broad reach - as seen in the engagement of over 7,500 participants; and ubiquity, with participants accessing content across ten countries, highlighting the time-space flexibility of these platforms. Other key opportunities involve the creation of dialogic spaces for interaction and the emergence of collective intelligence, where knowledge is constructed collaboratively, particularly during the post-live interviews in which theory and practice were connected through reflective dialogue.

On the right side of the diagram, the study identified substantial challenges. These include the production of high-quality content in digital environments defined by speed and ephemerality; the need for digital curation to ensure the credibility and educational value of shared material; gaps in digital literacy, especially among those less familiar with content creation tools; limited time availability, given existing academic responsibilities; and the necessity to guarantee accessibility, ensuring inclusive design for users with diverse needs. These findings indicate that the use of DSNs for professional development cannot be assumed to be simple or spontaneous; rather, it demands planning, training, and collaborative work.

The central overlap in Figure X presents the implications that arise when the identified challenges are addressed and the affordances of DSNs are fully leveraged. These include professional recognition, as participants reported increased visibility and institutional appreciation; motivation, as academics expressed renewed enthusiasm for professional learning; and reflective practice, evidenced by engagement with pedagogical theories and the re-evaluation of intuitive or habitual teaching strategies. The experience of participating in the OBSERVA Portal, particularly through collaborative content creation, acted as a catalyst for deeper learning and repositioning of the academic role.

Despite these promising outcomes, this study also faced several limitations. First, the sample size was relatively small and composed of volunteers already interested in educational innovation, which may have introduced a bias toward positive perceptions. Second, while the live broadcast format generated rich interaction, it also posed challenges related to digital confidence and logistical preparation that may have excluded less-experienced users. Third, the study focused on short-term reflections and did not explore long-term impacts on teaching practice or career development. Future research could adopt a longitudinal approach to investigate the sustained effects of DSN-based professional development and explore the experiences of those less engaged with digital environments.

In light of the findings, several implications and recommendations can be drawn. Institutions should recognise the educational potential of DSNs not only for communication but also for supporting peer-based, reflective professional development. This requires dedicated resources, including training programmes on content production, digital curation, and accessibility. Policies should also promote a culture of collaboration, ensuring that professional development is seen not as an individual responsibility but as a shared and supported institutional process. Furthermore, researchers and designers of professional development initiatives should consider blending DSN strategies with other formal and informal learning environments to maximise flexibility and relevance.

In conclusion, this study reinforces the value of DSNs as legitimate and powerful tools for fostering academic professional development in higher education. When intentionally integrated into practice, supported by infrastructure and guided by pedagogical principles, DSNs can expand the boundaries of institutional learning, encouraging dialogue, recognition, and continuous reflection in a connected and dynamic educational landscape.

Beyond its immediate context, the OBSERVA model offers a potential framework for institutions aiming to integrate social technologies into academic development. Its focus on collaborative content creation, peer validation, and reflective dialogue may inform similar initiatives in diverse settings, contributing to a more networked and participatory academic culture.

AUTHOR NOTES

Based on Academic Integrity and Transparency in AI-assisted Research and Specification Framework (Bozkurt, 2024), the authors of this paper acknowledge that the paper was reviewed, edited, and refined with the assistance of ChatGPT (Version 4.0 – May 2024) and Grammarly Pro (2024), complementing the human editorial process. The human authors critically assessed and validated the content to maintain academic rigor. 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

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Dilmeire Sant'Anna Ramos Vosgerau: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Supervision, Validation, Visualization. Writing – original draft, Writing – review & editing. Maria Fernanda Moretti Schneider: Conceptualization, Data curation, Formal Analysis, Investigation, Project administration, Writing – original draft, Writing – review & editing.

Data Accessibility Statement

The datasets used and/or analysed during the current study are available by on ZENODO Database by the link: https://zenodo.org/records/15828044

Sustainable Development Goals (SDGs)

This study is linked to the following SDG(s): Quality education (SDG 4) and Partnerships for the goals (SDG 17).

Ethics and Consent

This project was registered with the Brazilian Ethics Committee (https://plataformabrasil.saude.gov.br/l) under number 45570221.0.0000.0020, approved as opinion 4,815,255 and can be consulted under the title "MOBILIZATION VIA DIGITAL SOCIAL NETWORKS FOR SHARING INNOVATIVE PRACTICES IN HIGHER EDUCATION".

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OBSERVA Portal: Academics' Pedagogical Development through Storytelling and Digital Curation

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ABSTRACT

This study explores the perceptions of higher education academics from Brazil involved in the digital curation and sharing of teaching practices via the OBSERVA Portal, a platform designed to foster collaboration among educators. Grounded in a theoretical framework that combines pedagogical professional development, digital storytelling, and digital curation, the research investigates how these elements can enhance reflective practices among Brazilian academics.

In this qualitative, phenomenological research, twelve Brazilian academics participated in a structured digital curation process that begins with an initial interview to provide context for their storytelling. This is followed by a live session streamed on the OBSERVA Portal's YouTube channel. The process involves a collaborative effort where the research team identifies key concepts from the participants' storytelling, selects supporting scientific literature, drafts the text, and engages in discussions to finalize the content for publication on the portal. A follow-up interview captures the participants' reflections on the entire experience.

Findings reveal that participation in the OBSERVA Portal not only facilitated reflection and knowledge sharing among Brazilian academics but also helped to build a community of collaborative practice. The act of digital curation—organizing and selecting relevant materials—enhanced their insights and appreciation of their teaching efforts. Ultimately, this initiative has encouraged academics to engage deeply with their practices and contribute actively to a shared repository of pedagogical experiences within higher education in Brazil.

Keywords

digital social networks; pedagogical professional development; higher education; digital curation; storytelling.

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INTRODUCTION

Current academic demands require continuous adaptation to new challenges in teaching and learning. As a result, pedagogical professional development (PPD) extends beyond simply updating disciplinary knowledge; it encompasses the attributes, competencies, and insights necessary for maintaining high-quality, research-informed teaching (Garcia & Vaillant, 2009; Kenski et al., 2019; Queiros & Aroeira, 2020; Schneider et al., 2023).

Teaching in higher education is a complex and multifaceted endeavour that requires both theoretical and practical knowledge, developed through reflection and collaboration (Bozu et al., 2009; Lahtermaher & Cruz, 2022). Engaging in exchanges of experiences and dialogues with peers is essential for expanding knowledge, enhancing professional agency, and valuing individual contributions (Meyer & Vosgerau, 2020; Passos et al., 2020; Wagner & Souza, 2022). When individual and collective experiences, as well as theory and practice, intersect, robust academic practices emerge that better meet the demands of contemporary higher education.

Digital culture introduces both complexity and potential to professional development (PD). The rise of technological and networked environments has transformed academic work, requiring a deeper engagement with educational implications (Moreno-Guerrero et al., 2020). The internet, in particular, facilitates communication, interactivity, and knowledge sharing, fostering more personalised and dynamic models of PD (Flintoff et al., 2014). In this context, new strategies such as digital curation (DC) have become increasingly relevant for helping academics navigate and make sense of the vast array of digital resources available.

Digital curation (DC) has gained prominence as both a professional skill and an educational strategy. Initially associated with cataloguing and preservation in the arts, DC now plays a crucial role in the selection, organisation, and contextualisation of academic content. It helps reduce workloads and enhance pedagogy by enabling academics to manage and refine digital resources efficiently (Resende et al., 2019). Alongside this technical and organisational aspect, digital storytelling (DST) offers a narrative and reflective approach to professional development.

Digital storytelling (DST) has emerged as a powerful practice for reflective learning and the construction of professional knowledge. By promoting narrative-based reflection, DST allows academics to interpret and share their experiences, fostering deeper engagement with their practice while contributing to a shared understanding of pedagogy (Gachago & Livingston, 2020). Grounded in the ability to humanise and contextualise knowledge, DST supports more meaningful approaches to PPD.

As digital culture influences academic practice, collaborative online platforms have become central to professional development (Hissa & Araújo, 2021; Meyer & Vosgerau, 2020; Vosgerau & Meyer, 2023). Rather than following hierarchical models, platforms like the OBSERVA Portal (https://observatoriodepraticas.com.br/) promote peer-led knowledge sharing through engagement and reflective storytelling. By encouraging networked communication and co-creation, such initiatives align with evolving views on how academics learn and develop within digital environments.

This study examines the intersection of digital storytelling and digital curation in supporting PPD among Brazilian academics through the OBSERVA Portal platform.

RESEARCH CONTEXT: THE OBSERVANT PORTAL AND THE PRACTICE OF DIGITAL CO-CURATION

Launched in 2014, the OBSERVA Portal addresses a recurring challenge in academic life: effective teaching practices often remain unseen by the broader community. Conceived as a "modern toolbox" (Meyer et al., 2015), it serves as a curated repository of pedagogical knowledge, offering lesson plans, methodological guidance, and real-world examples. Its design, informed by a doctoral study involving 32 academics (Meyer & Vosgerau, 2018; Vosgerau & Meyer, 2023), emphasizes visibility, collaboration, and the recognition of teaching expertise.

In its early stages, content was curated solely by the research team based on studio-recorded interviews. However, during the COVID-19 pandemic, the Portal evolved into a networked platform. Live broadcasts through social media transformed its technical and pedagogical design, supported by a doctoral study (Schneider & Vosgerau, 2023) that positioned digital co-curation as central to professional development.

Through digital co-curation, academics became co-producers of content. Their active role in validating and shaping materials created opportunities for professional growth and established a collaborative, open-access repository (Beviláqua et al., 2021). Supported by a multidisciplinary team, the process incorporates digital storytelling into live sessions to enhance academic agency and engagement.

Figure 1 presents the current content production model, referred to as the Fourth Version (Schneider & Vosgerau, 2023). Originally designed to explore the role of social networks in extending the Portal's reach, it has since been adapted to highlight co-curation as a structured process of professional development. The production team includes undergraduate, master's, and doctoral fellows, who contribute at all stages of development. This collaboration positions academics not as passive recipients but as active contributors engaged in co-constructive knowledge curation.

Academics are recruited in two main ways (Step 1): through an open call publicized via OBSERVA's social media and academic networks, or by nomination from colleagues or students. In both cases, nominees are informed about the Portal's aims and invited to a live storytelling session. After confirming their interest, participants attend an initial scoping interview to ensure alignment with the framework developed by Meyer and Vosgerau (2020).

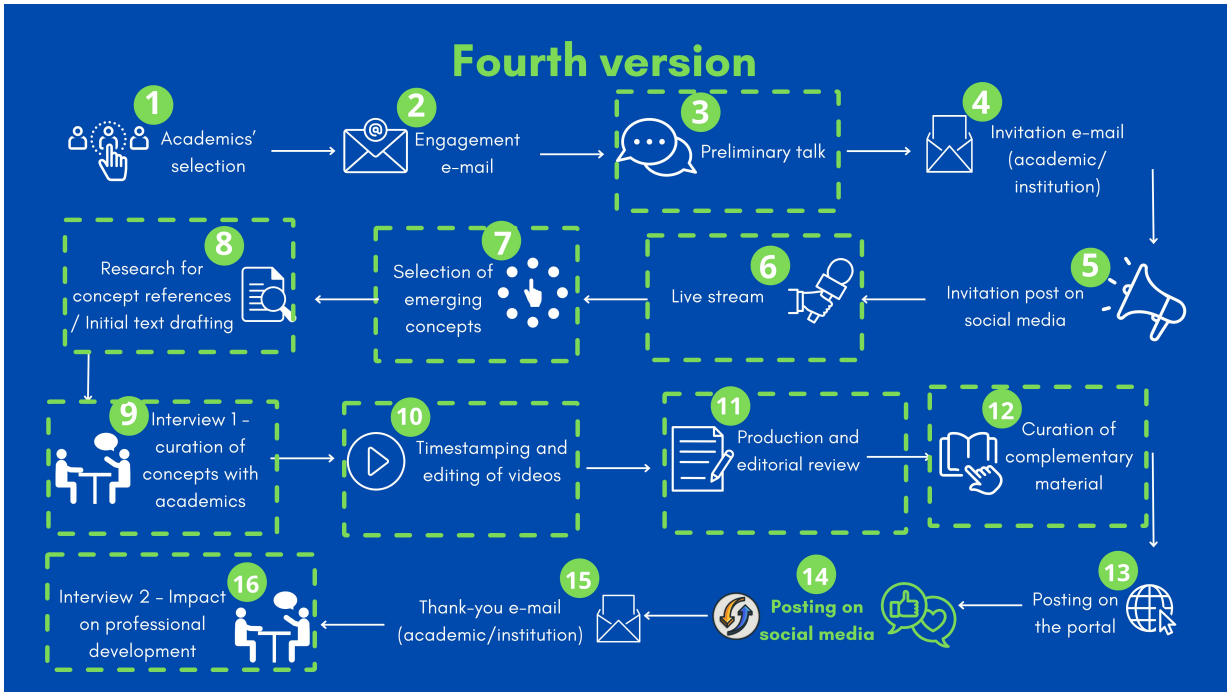


Figure 1: Production Process – Fourth Version © The Authors

Once selected, academics receive a formal invitation (Step 2) and participate in a preliminary meeting (Step 3) to reflect on their practice and learn about the curation process. During this stage, consent forms and photographs are collected. An official invitation is also sent to their institution (Step 4), and the upcoming live session is announced on the Portal's social media (Step 5).

The live session (Step 6), broadcast on the Portal's platforms, allows academics to present their practice through digital storytelling, interact with the audience, and respond to questions. After the broadcast, recordings are analysed to begin the curation phase. In concept selection (Step 7), postgraduate and postdoctoral researchers identify themes and pedagogical insights from the narratives, which will form the basis for each academic's personalised profile page and supporting materials, as well as short videos for dissemination.

In the referencing stage (Step 8), the writing team identifies literature aligned with the selected concepts, prioritising Brazilian journals rated A1/A2 in Qualis and international Q1–Q4 publications in Scimago. In a follow-up meeting (Step 9), academics review the concepts, references, and draft page, providing feedback to ensure alignment with their pedagogical intentions. Once validated, materials proceed to video editing (Step 10), followed by editorial review (Step 11) and the inclusion of complementary teaching resources (Step 12). Undergraduate fellows support editing and proofreading before publication on the Portal (Step 13), after which the content is promoted through social media (Step 14).

Finally, a thank-you message is sent to the academic and their institution (Step 15), and a follow-up interview (Step 16) captures reflections on the experience and its contribution to professional development. Nine steps in this workflow - highlighted in Figure 1 - represent the core phases of digital curation and storytelling, encompassing selection, refinement, validation, and publication of pedagogical content.

The Portal's current structure is closely aligned with pedagogical strategies that utilise digital culture to support professional development. Central to this are digital curation and digital storytelling, which foster participation and shared authorship while offering practical and flexible approaches to professional growth. The following section outlines their theoretical basis, examining their contributions to reflection, knowledge sharing, and innovation in teaching.

DIGITAL CURATION AND STORYTELLING: STRATEGIES FOR PEDAGOGICAL PROFESSIONAL DEVELOPMENT

The social transformations of the 21st century have placed digital culture at the forefront of education, leading to significant shifts in pedagogical professional development (PPD) across various contexts and time frames. In this evolving landscape, educators are encouraged to take ownership of their learning by reflecting on their teaching practices and recognising the essential role of technology (Bates, 2022). Consequently, digital curation has become a crucial component for evaluating information and educational resources.

The term ‘curation’, derived from the Latin word ‘curare’ (meaning ‘to care for’), has shifted from its origins in Roman law and the arts to refer to the organisation and filtering of digital content in the 21st century (Ramos, 2012; Siebra et al., 2016). Digital curation encompasses the selection, preservation, maintenance, and archiving of digital data, resulting in participatory repositories. Its value lies in ensuring reliability, preventing digital obsolescence, and managing various content formats. This flexibility enhances pedagogical practices and positively contributes to education (Chagas et al., 2019). Essentially, the digital curator plays a vital role in making information accessible and managing the growing volume of resources by selecting and safeguarding relevant data (Bruno et al., 2023).

Curatorial activities, especially those aimed at sharing materials and content, naturally align with educational objectives. They act as a means of socialisation and knowledge mediation. The potential of digital curation to inspire online learning experiences is well-documented, reinforcing the collaborative ethos presented by Vosgerau and Meyer (2023). The primary goal of digital curation is to preserve digital objects for access and reuse. Key benefits include ensuring content integrity and accessibility, maintaining institutional memory, enabling new knowledge extraction, and preventing duplicated efforts (Sayão & Sales, 2016; Yamaoka, 2012). According to the Digital Curation Centre (2024), digital curation is a reliable pathway for the long-term reuse of resources, guided by a reflective process of selection and preservation. The curator applies professional judgment and established criteria to ensure both relevance and longevity (Antonio et al., 2012; Wolff & Mulholland, 2013).

As a practice associated with digital technologies—through the selection, organisation, preservation, and dissemination of content—digital curation positions the curator as a key figure in ensuring material credibility and usefulness. In educational contexts, curatorial work enhances teaching by aggregating and contextualising information on specific themes (Albertson & Johnston, 2021). It supports educators in reflecting on and improving their practices while contributing to the creation of reusable and accessible knowledge repositories, as seen in initiatives that promote experience sharing (Vosgerau & Meyer, 2023).

The educational intent behind digital curation empowers academics to select and organise content to expand learning opportunities autonomously (Resende et al., 2019). When educators commit to digital culture, they can use curation to circulate ideas, develop materials, and engage in shared authorship

(Lopes et al., 2014). In this regard, educational curation involves planning, researching, selecting, linking, and sharing relevant content, thereby optimising educators' time and enhancing learning effectiveness (Chagas et al., 2019). It bridges theory and practice while fostering learning through knowledge management and pedagogical innovation (Mihailidis, 2015; Mihailidis & Cohen, 2013; Rocha & Gouveia, 2023).

In the context of innovation, digital technologies can support professional development effectively, but only when accompanied by the democratisation of information and digital inclusion (Schneider & Vosgerau, 2023; Ungerer, 2016). These principles also support digital storytelling (DST), a practice that increasingly connects individual experiences with broader pedagogical reflections. DST is a powerful means of enhancing teaching and learning, providing educators with new competencies (Brites et al., 2018). Its benefits for professional development include increased engagement, collaboration, and critical reflection (Vosgerau & Meyer, 2023). While storytelling has historical roots, its digital forms have become practical tools for sharing personal teaching experiences and cultivating reflective thinking (Rosales-Statkus & Roig-Vila, 2017).

Although digital storytelling originated in the marketing field with Web 2.0 (McLellan, 2006), its application in education is distinct due to its pedagogical intent. It encourages educators to reflect on their practices, gain confidence, and become more attuned to their professional roles, making it a valuable tool for professional development. In online environments, educators can share their stories more informally, fostering connection and broader dissemination (Rosales-Statkus & Roig-Vila, 2017; Vieira et al., 2021).

DST is a communication practice that involves sharing personal experiences through digital media. It aids professional development by encouraging reflective practices, utilising clear language to express complex ideas, and highlighting the importance of lived experiences in pedagogical analysis (Brites et al., 2018; Schmier, 2022; Tenório et al., 2020; Vieira et al., 2021). Through DST, educators can connect more effectively with their peers, cultivating empathy and new perspectives on teaching. The narrative process also promotes collaborative work, planning, communication, problem-solving, assessment, and digital literacy (Çetin, 2021).

As a digital medium, DST combines stories, images, sounds, and videos to create emotionally engaging content. Its relatable and personal tone helps educators forge strong connections with their classroom practices, thereby supporting pedagogical innovation (Meyer & Vosgerau, 2018). This connection encourages reflection and experimentation, allowing educators to move beyond routine methods (Tenório et al., 2020). Additionally, the flexibility and accessibility of digital stories make them ideal for sustained engagement and active participation in professional development.

The relationship between digital curation and digital storytelling (DST) presents a significant opportunity for professional and personal development (PPD) by promoting both reflection and innovation (Flintoff et al., 2014). While DST enhances professional engagement, digital curation—especially within digital social networks—provides a strong theoretical and practical basis for developing effective teaching methods (Vosgerau & Meyer, 2023). These curated stories, delivered in accessible and engaging formats, maximise outreach and encourage interaction, particularly during live broadcasts (Almeida & Alves, 2020).This strategic integration allows for more flexible and inclusive professional development, supporting continuous learning and innovation for academics in higher education.

METHODS

Research Method

This qualitative study, grounded in phenomenology (Creswell, 2014), interprets how academics construct meaning from their participation in the OBSERVA Portal, where digital storytelling and digital curation support PPD.

Research Design

The study utilises secondary data from the OBSERVA Portal project, focusing on academics' engagement in digital storytelling, mediated by digital curation, and its impact on PPD. The data consists of materials from Cycles I and II: 12 live sessions, 11 recordings from Interview 1, and 7 recordings from Interview 2. These sources, centred on live-streamed practices and follow-up interviews, captured how academics shared their experiences and reflected on their DPD.

Data Collection Tools

Data were collected during three key moments of the OBSERVA Portal curation process:

1. Live Sessions (Step 6): Academics narrated their teaching practices through digital storytelling.
2. Interview 1 (Step 9): Participants co-authored content for their personalised web pages, validating concepts and references.
3. Interview 2 (Step 16): Focused on participants reflecting on their engagement and its perceived influence on professional development.

All interviews were conducted online, initially via Zoom and later via Microsoft Teams. Audio and video files were archived and curated by the editorial team for publication.

Sampling

The study involved 12 academics affiliated with the Portal Observa project. Participants took part in Cycles I and II (Table 1):

- Cycle I (late 2022 to early 2023) included academics from the fields of Human Sciences, Agricultural Sciences, and Earth and Exact Sciences.
- Cycle II (second semester of 2023) comprised participants from Exact Sciences, Health, Humanities, Applied Social Sciences, and Linguistics.

This diversity ensured a varied and representative sample of higher education academics engaging with digital curation.

Table 1. Participants Cycle I and Cycle II

Cycle I (I)	Theme	Institution	State	Access link
Acad01	Accessibility for students with disabilities in higher education	Federal University of Bahia	BA	https://youtu.be/k46JDQ1Wl1A?si=O0sEPdaW00OeRHn7
Acad02	Viable innovations in teacher training	Federal University of Uberlândia	MG	https://youtu.be/2ijO-krxbG4?si=vlFt1hOnKWWWwD6C
Acad03	Problem-Based Learning	UNOPAR College of Arapong	PR	https://youtu.be/XSHRjAnTBcw?si=9exqBMBLEiaE4SRB
Acad04	Parallels between popular play and the teaching of Physics and Mathematics	Uniandrade	PR	https://www.youtube.com/live/9aMY0tLnyWA?si=RtCzaVwJyjw56zdg
Acad05	Teaching Philosophy as a Way of Life	Federal Institute of Education, Science, and Technology of Mato Grosso do Sul	MS	https://www.youtube.com/live/gjimLhEwqas?si=XTASWY6XtDdovOu0
Acad06	An exercise in Brazil's imagination from the perspective of equality, based on Darcy Ribeiro	Santo Tomás de Aquino Institute	MG	https://www.youtube.com/live/fGRy3Ond3Vk?si=LaQtz68ov96GgzFU
Cycle II (II)	**Theme**	**Institution**	**State**	**Access link**
Acad01	Teaching focused on human relations: results for education and Society	Federal Institute of Education, Science, and Technology of Mato Grosso do Sul	MS	https://www.youtube.com/live/0QA4HuVvQ7M?si=b5HIjye89PAYCfkQ
Acad02	Implementation of the ICF biopsychosocial model for academics	UNICURITIBA	PR	https://www.youtube.com/live/8VKIkPQYKmY?si=giFeT3W5DMPcnj0V
Acad03	The contemporary teacher between tradition and urgency	State University of Maringá	PR	https://www.youtube.com/live/ZgecYVPN1nU?si=epnMloeo9pR7_02t
Acad04	Use of PjBL in Teaching Quantitative Methods Courses	Pontifical Catholic University of Paraná	PR	https://www.youtube.com/live/-N_ujg7SVfY?si=YPQ5hy_lFLPybM-s
Acad05	Higher Education: Inclusion practices, strategies, and dynamics that aim to bring learning to everyone	Adamantina Integrated Colleges	SP	https://www.youtube.com/live/-cL6tiUoakQ?si=Rphj46WodNeTE97q
Acad06	Learning English in Practice	Private Mentor	PR	https://www.youtube.com/live/N-BkGLXLY9s?si=kDv6GV8L-_lijytL

Research Procedures

The curation process began with the academics' live sessions, followed by Interview 1, where participants validated and expanded their narratives. Emerging concepts were presented for reflection, helping to develop a collaborative professional identity. Participants also contributed supplementary materials and references, affirming their role as co-authors of their personalised web pages.

Interview 1 concluded with suggestions to include student testimonials. All materials were reviewed and edited by the editorial team, who managed transcription, video editing, and formatting.

In Interview 2, participants reflected on their engagement, discussing strengths and weaknesses, suggesting improvements, and proposing updates to their content. This iterative format allows for continual updates in response to new insights or teaching contexts.

Data Analysis

The data were analysed using ATLAS.ti with Saldaña's (2013) coding cycles. Transcripts were coded in three stages: in vivo and narrative coding to preserve participants' voices, thematic coding to identify patterns, and pattern coding to group themes into broader concepts.

This integration enabled a robust analysis of participants' DPD trajectories, capturing both shared features and individual variations in their engagement with digital curation.

Validity and Reliability Measures

To ensure trustworthiness, purposive sampling followed the criteria set forth by Meyer and Vosgerau (2018), which was operationalised as a checklist to confirm the relevance to the phenomenon.

Credibility was reinforced through a two-stage validation process: in Interview 1, concepts were presented and discussed; in Interview 2, participants reviewed and approved content prior to publication and reflected on their professional development.

Data triangulation drew on three sources for each participant - the live session, Interview 1, and Interview 2 - allowing for a comprehensive analysis of each academic's curatorial trajectory.

FINDINGS AND DISCUSSION

This study examines how digital storytelling and digital curation support professional development among Brazilian academics through the OBSERVA Portal. The first findings revealed the innovations academics considered significant and chose to share on the Portal - practices they sought to make visible to peers.

Innovation Highlighted By Academics When Sharing Their Practice

Innovation refers to actions aimed at transforming pedagogical practice through new methodologies and resources. Three types were identified - technological, social, and educational - each illustrated by examples from participants' narratives (Table 2).

Table 2: Approaches to innovation in pedagogical practice and illustrative quotes

Innovation Type	Focus/Theme	Participant Quotation
Technological	Online application	For those who want to plant there, there is **the Paraná Mais Verde app**, which you can download on your Android phone [...] you can identify the species, [...] and it is easy to get seedlings of native species. (I-Acad03)
	Social media	Show that their social being, they're being a citizen, is also on **social media**, right? (I-Acad05)
Social	Critical consciousness	[...] based on what **Paulo Freire said**, we came up with the idea of bringing a **bonsai to the classroom** [...] we take a bonsai, it's usually fruitful, and it goes out and visits the homes of all the students who participate in the course. (I-Acad02)
	Environmental awareness	which you can download on your Android phone [...] you can identify the species, [...] and it is easy to get seedlings of native species. (I-Acad03
	Integral Education	So, when considering justice and the **integral formation of the individual,** a basic understanding of what ethics entails is essential when I go out on the street. (I-Acad05)
	Issues of Afro-Brazilian culture	[...] the subject is the **history of African indigenous Afro-Brazilian** culture, it's a subject that I always say, that I ask permission to teach because I'm a phenotypically white woman, right [...] but I will never be able to know what the pain of a black woman is like, what the pain of a young black man who goes out on the street and is already suspicious at first sight [...]. (I-Acad06)
	Deconstructing the myth of fear of mathematics	We bring the student to our side, and that's my main idea here today: bringing the student to our side is dealing with the student with their difficulties, is understanding that many times they really **don't like math, and, it's understanding** that sometimes they understand math but not enough for that subject. (II-Acad01)
	Inclusion	In this '**accessible cinema**' project, cinema sessions were held with accessibility features, including audio description, which makes the film accessible to blind people, as well as hidden subtitles, closed captioning, and a sign language window, all aimed at enhancing accessibility for the deaf. (I-Acad01)
		[...]we can **approach it within the ICF (**International Classification of Functioning and Disability and Health)**, bringing the reading** as if it were a photograph of the moment in which this patient is being evaluated, bringing a personality, a personalisation of the evaluation of this individual [...]. (II-Acad02)
		[...] I do it like this: **half of the class will defend inclusion**. We create a 100% debate, where one half of the class acts as a jury, and the other half acts as a 100% against inclusion. But then I put a scenario [...] a child who has autism [...]. (II-Acad05)
Educational	Integration of the analysis of artistic	I noticed **that physics was very present there in the artistic performance** and I had the opportunity to live outside of Brazil for a while and missing our culture, right, made me curious to

	performances into physics teaching	research a little more about the rhythms of our music[...]. (I-Acad01)
	Comic books, to spark interest in literature	[...]she was **developing more practices, bringing in other languages like comic books**, using family members who worked with programming, she made a game [...]. (II-Acad03)
	Project-Based Learning (PJBL)	[...] use of PBL teams and such, PJBL is ready to use the project method and good project management practices in the classroom so that this practice makes teaching more effective, so bringing project ideas to the classroom is perfect for using **project-based learning in teaching quantitative methods subjects**.(II-Acad04)
	Mock Trial	[...] I do it like this: half of the class will defend inclusion. We create a 100% debate, where one half of the class acts **as a jury**, and the other half acts as a 100% against inclusion. But then I put a scenario [...] a child who has autism**,** and she took the notebook of the classmate next to her who had finished the math activity and tore it up completely [...]. (II-Acad05)
	Research as a Pathway to Pedagogical Professional Development	Where I got my inspiration from, I don't know, sticking to books and theories, I used them, I always studied them [...], there's some source, someone wrote about it, let me research it.' Right? So this research is very important to make this very clear to you, academic who is listening to me now, **research, research, be curious**. (II-Acad06)

Technological innovation included the use of the Paraná Mais Verde app for environmental education and social media in philosophy teaching. Both, shared by Cycle I academics, show how digital tools can foster ecological awareness and ethical reflection.

Social innovation encompasses projects that enhance collaboration, critical thinking, and engagement with contemporary issues, often by humanizing teaching. Examples of this include accessible cinema sessions with inclusive features, activities inspired by Paulo Freire, themes rooted in Afro-Brazilian culture, and initiatives aimed at dispelling the fear of mathematics. Other practices have raised awareness of the International Classification of Functioning, Disability and Health (ICF) and utilised mock trials to facilitate debates on inclusion. Developed across both cycles, these initiatives highlight innovation as a pathway to inclusive and socially engaged pedagogy.

Educational innovation has restructured teaching methodologies. This includes integrating artistic performance into physics, using comics and games to stimulate interest in literature, and applying Project-Based Learning (PBL) in quantitative methods courses. In some cases, innovation has gone beyond methodology to include content, such as linking research-based approaches to professional development.

In summary, the practices outlined in Table 2 demonstrate how academics have mobilised innovation in distinct yet complementary ways. Technological approaches have improved access to resources, social approaches have promoted humanisation and inclusion, and educational approaches have reconfigured classroom practices. Together, these innovations illustrate the varied ways that innovation contributes to professional development.

While these examples reveal what academics valued sharing on the Portal, the findings also extend beyond the practices themselves. Creating spaces for interaction, exchange, and mutual support underscores collaboration as another key pathway to professional development, which will be addressed in the next section.

Collaborative Engagement: A Pathway to Professional Development

A second category emerged that aligns closely with the study's main objective: peer collaboration. This was described as a valuable process that positioned academics at the centre of their own learning while enhancing classroom practice. Three interconnected themes illustrate this category: sharing space, benefits, and reach (Figure 2).

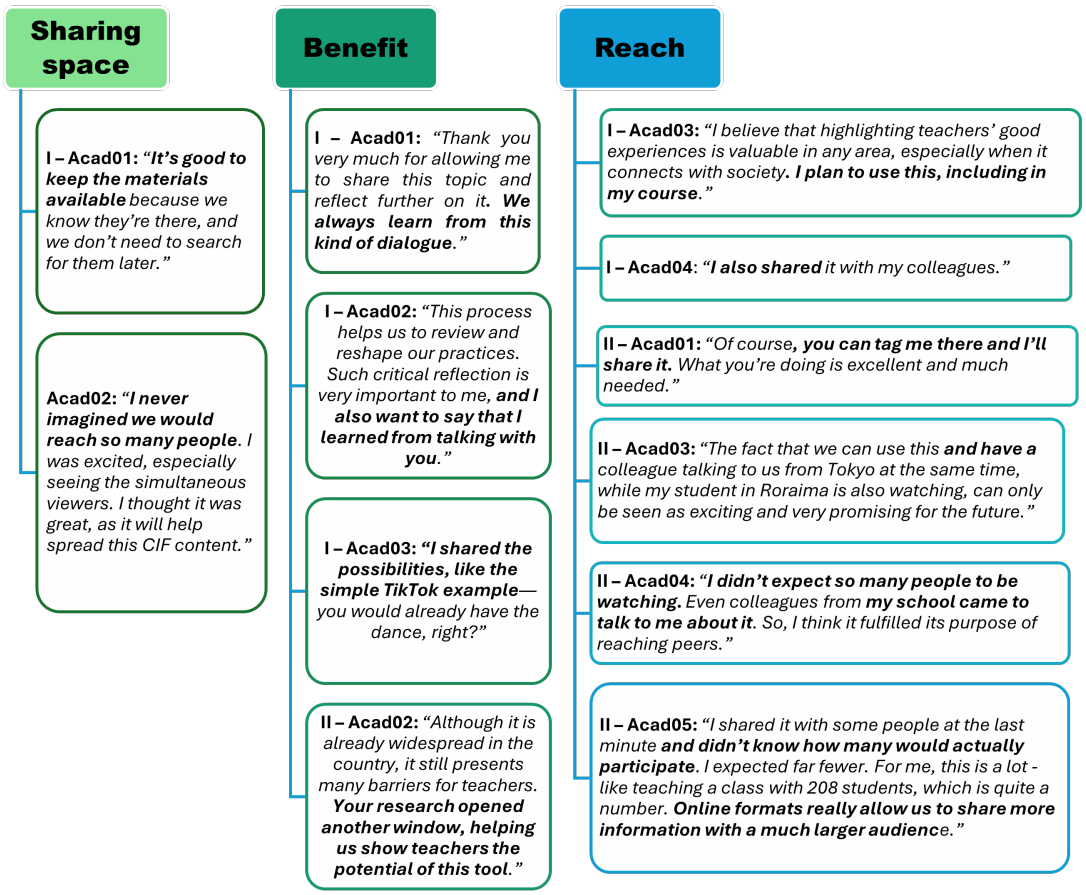


Figure 1: Collaborative engagement: A pathway to professional development © The Authors.

Sharing space highlights the importance of environments for exchanging experiences. Academic 01 (Cycle I) valued the OBSERVA Portal as a tool for professional development, while Academic 02 (Cycle II) emphasised the relevance of forums that promote knowledge exchange in higher education.

Benefits reflect the perceived gains from collaboration. Academic 02 (Cycle I) noted that it helped systematise her practice and generate materials. Academic 03 (Cycle I) and Academic 02 (Cycle II) observed that sharing experiences increased awareness of specific issues, and Academic 01 (Cycle I) valued the opportunity to contribute to collective professional growth.

Reach illustrates the potential for practices to extend beyond individual classrooms. Academic 03 (Cycle I) believed his practice could reach a broader academic and student audience. Academic 04

(Cycle I) shared materials with colleagues, and Academic 01 (Cycle II) disseminated content via social media. Academic 03 (Cycle II) pointed to the promise of social networks, while Academic 04 (Cycle II) was contacted by peers after publicising his practice. Academic 05 (Cycle II) also shared the videos with her students.

Overall, innovation reflects the practices academics considered worth sharing, while collaboration shows how the OBSERVA Portal enabled exchange, amplification, and collective development, thereby fostering professional growth.

Beyond these findings, the analysis also revealed how academics perceived the impact of their participation in the digital curation process. These perceptions shed light on how collaboration, reflection, and co-authorship contributed to professional development, as explored in the next section.

Academics' Perceptions of the Contribution of Participation in the Digital Curation Process to their Professional Development

Academics view participation in the OBSERVA Portal's digital curation process as a valuable opportunity for professional development. Engagement and sharing among peers encourage critical reflection, self-awareness, and the development of socio-emotional skills. Peer collaboration serves as a key factor in this process, which can be understood through three dimensions: reflection, awareness, and empathy (see Figure 3).

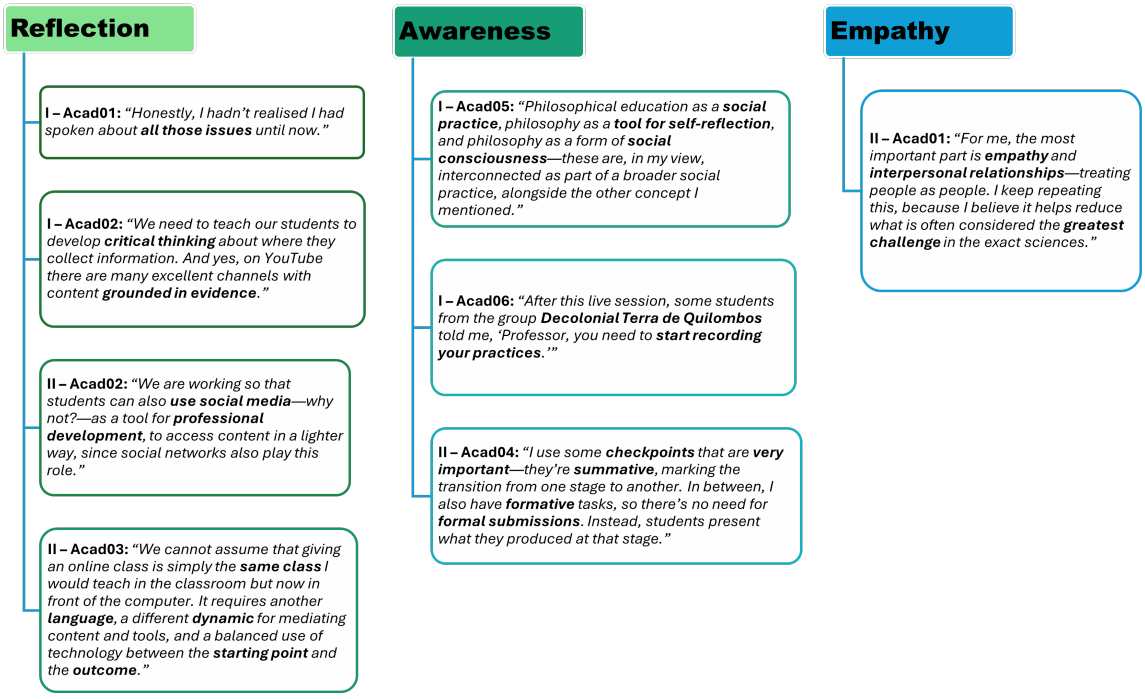


Figure 2: Reflection, awareness, and empathy as dimensions of peer collaboration in digital curation © The Authors

Reflection on pedagogical practice was identified as the most prominent theme. Academics reported that collaboration stimulated a continuous process of self-assessment and improvement. Academic 01 (Cycle I), for example, noted that using the Portal's social media resources supported this process, while Academic 02 (Cycle I) explained that collaboration encouraged her to rethink her choices and clarify her pedagogical intentions. In Cycle II, Academic 02 pointed out that the organisation of the

curated texts prompted her to reconsider her practice, and Academic 03 described a persistent concern with innovating to optimise students' learning.

Collaboration also contributed to greater **awareness** of one's own actions in the classroom. Academics such as Academic 05 and Academic 06 (Cycle I) and Academic 04 (Cycle II) emphasised that exchanging experiences gave them a clearer and more in-depth understanding of their own teaching. The opportunity to externalise and confront their experiences with colleagues allowed for a more lucid comprehension of their methods and results.

Finally, collaboration was shown to be an effective means of fostering **empathy**, which is central to emotional intelligence and interpersonal relationships. Academic 01 (Cycle II) highlighted the importance of empathy and dignity in human interactions, underlining how peer engagement can strengthen social skills that are vital in educational settings.

The analysis indicates that peer interaction drives reflection and self-awareness, while participation in digital curation fosters a sense of appreciation and empowerment. Participants reported that the experience exceeded their initial expectations, showing that the visibility of their practices enhanced both individual reflection and professional recognition. Within this category, two main themes were identified. The first, **appreciation and empowerment**, captured how academics perceived the impact of their participation (Figure 4).

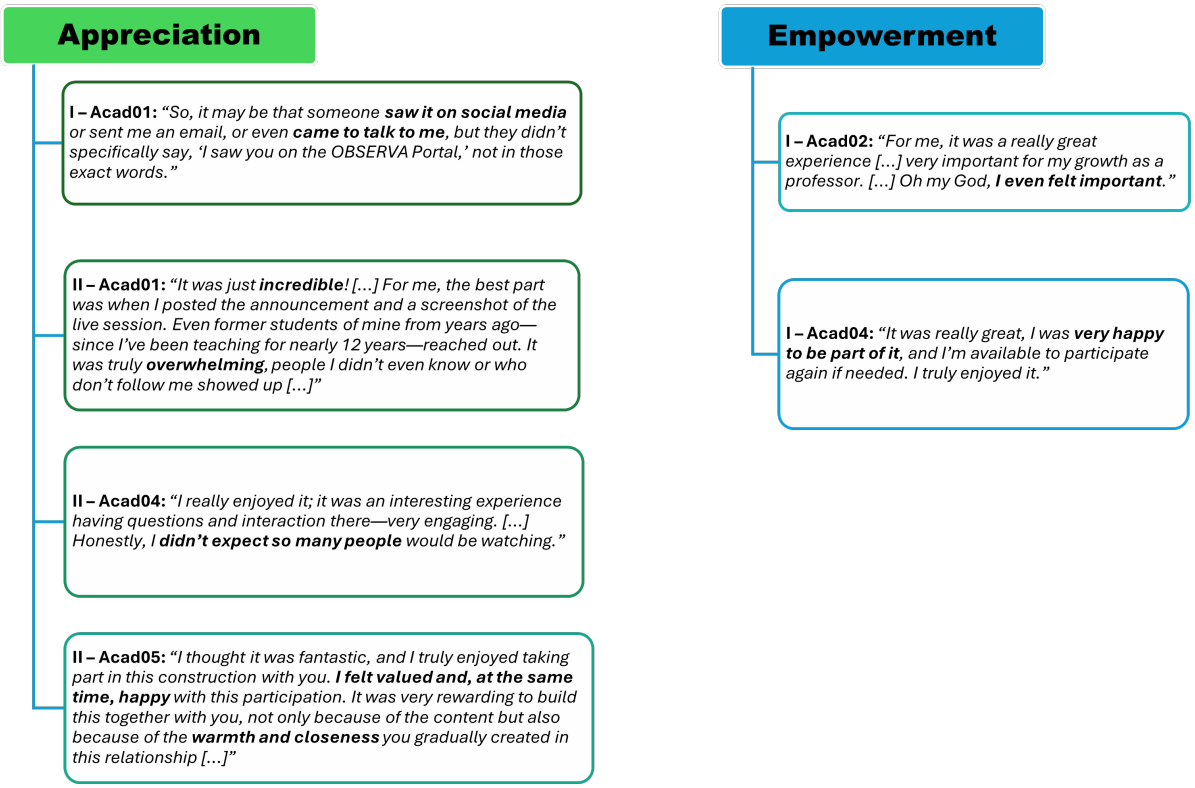


Figure 4: Appreciation and empowerment in digital curation participation © The Authors

Perceptions of **appreciation** were expressed in different ways. Academic 01 (Cycle I) felt "honoured and surprised" by the invitation to participate, while Academic 04 (Cycle I) expressed satisfaction and willingness for future engagement. Academic 01 (Cycle II) described the impact of her talk as "amazing" and "overwhelming", emphasising the value she perceived in reaching a wide audience.

Surprise at the Portal's reach and being contacted by colleagues after sharing their practices were common feelings for Academic 04 and Academic 05 (Cycle II).

Empowerment, in turn, was linked to the perceived influence of their practice within the community. Academic 02 (Cycle I) described a defining moment in her professional journey when a colleague was inspired by her experience to create a study group. This influence on peers reinforced her sense of empowerment and the importance of academics' roles within the educational community, showing that sharing practices not only improves individual teaching but also strengthens the collective.

In addition to appreciation and empowerment, participation in digital curation was consolidated as a direct pathway to professional development. This category underscored how engagement in content production and exposure to new references significantly shaped the educators' trajectories. Two themes emerged within this process: co-authorship and deepening (Figure 5).

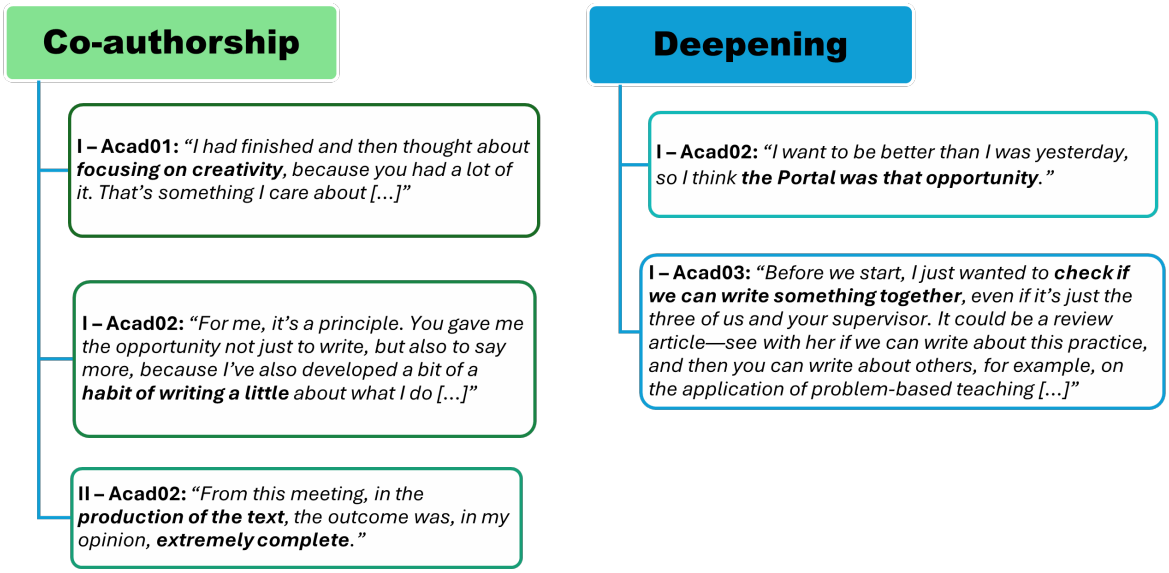


Figure 5: Co-authorship and deepening as outcomes of digital curation © The Authors

Co-authorship was expressed in the collaborative writing of personalised pages. Based on their narratives, academics reflected on classroom practices, consolidating a cycle of continuous improvement. **Deepening** refers to the validation of pedagogical practices through exposure to new concepts and references. The curation process enabled academics to engage with theoretical content and colleagues' experiences that often confirmed and enriched their approaches. This external validation strengthened their confidence and deepened their understanding of the principles underpinning their teaching.

Active participation in co-authorship thus became a catalyst for reflection and critical analysis of practices. Producing content from their narratives led educators to revisit and refine their teaching, while contact with relevant theoretical references encouraged them to pursue further study and share materials with colleagues. This process bridged theory and practice and consolidated digital curation as a tool for continuous professional development.

Academics' involvement in the digital curation process also demonstrated how they enacted and benefitted from the experience, turning it into a pathway for ongoing growth. Within this category, two additional themes were distinguished: **learning and collaboration** (Figure 6).

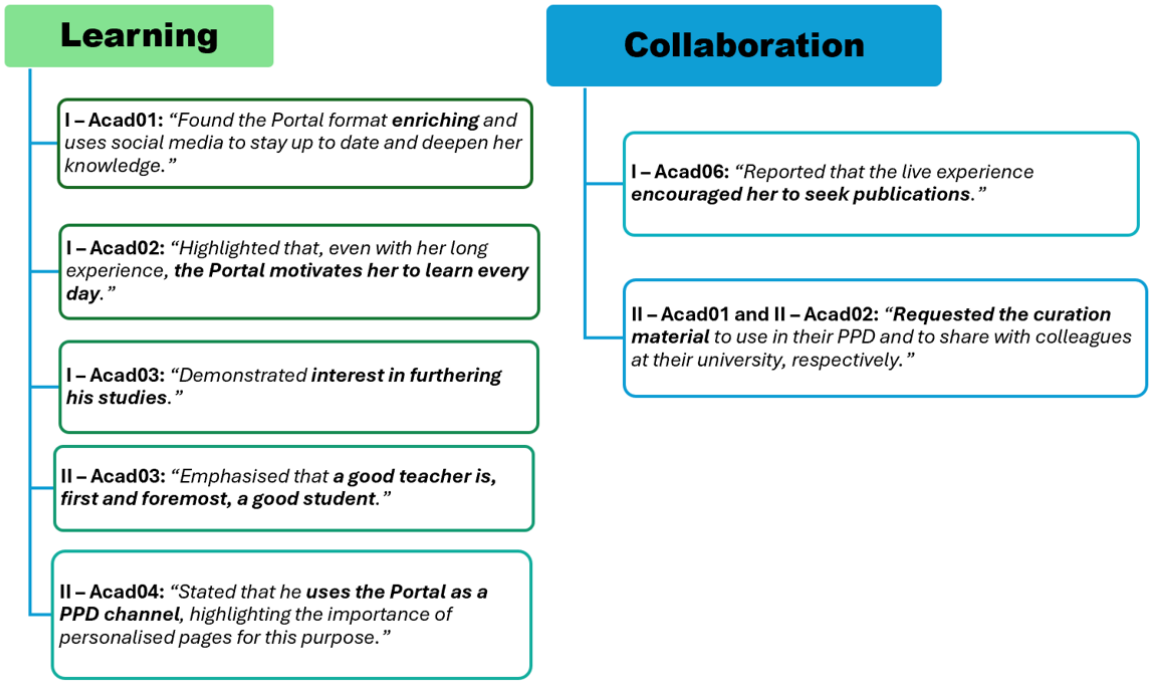


Figure 6: Learning and collaboration in the digital curation process © The Authors

Learning emerged as central, with academics using the Portal and curation process to enhance their knowledge. Academic 01 (Cycle I) found the Portal format enriching, using its social media channels to stay updated and deepen her studies. Academic 02 (Cycle I) stressed that, despite her long experience, the Portal motivated her to learn every day. Similarly, Academic 03 (Cycle I) expressed interest in advancing his studies, while Academic 03 (Cycle II) emphasised that a good teacher is, first and foremost, a good learner. Academic 04 (Cycle II) reported using the Portal as a channel for professional development, highlighting the importance of personalised pages for this purpose.

Collaboration was manifested in academics' willingness to share curated knowledge and materials with peers. Academic 06 (Cycle I) noted that participating in a live session motivated her to pursue publications. Academic 01 and Academic 02 (Cycle II) requested access to the curated material to support their professional development and to share with colleagues at their universities. Their willingness to provide additional materials for their personalised pages and to engage actively in the textual curation stage demonstrated a commitment to collective knowledge-building and community strengthening.

Finally, academics' perceptions of their participation revealed the **qualitative impact** of digital curation. This category captured how they evaluated the process, the portal team, and the final materials, expressed through two themes: **respect and production** (Figure 7).

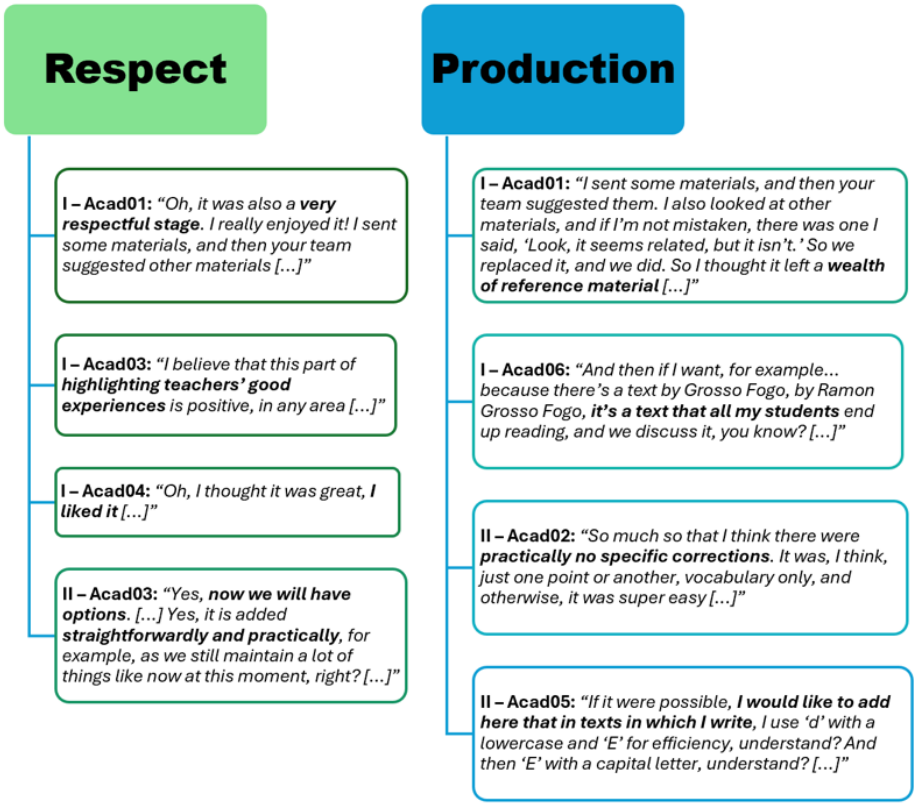


Figure 7: Respect and production in academics' evaluation of digital curation © The Authors

Respect referred to how academics experienced co-authorship. Participants consistently described the process as respectful, noting that genuine collaboration and appreciation of their contributions resulted in outputs they valued. Academics 01, 03, and 04 (Cycle I), as well as Academic 03 (Cycle II), reinforced this view. Academic 03 (Cycle II) further emphasised that the Portal demonstrated the true meaning of co-authorship in practice, affirming the sense of partnership as a two-way process.

Production related to academics' proactive contributions to their personalised pages. Academics 01 and 06 (Cycle I) and Academics 02 and 05 (Cycle II) contributed directly with materials, enabling the creation of reliable content and the dissemination of innovative practices. Academic 01 (Cycle I) valued the jointly produced materials as "rich and reliable for consultation". Academic 02 (Cycle I) highlighted that the process promoted reflection, reiterating praxis as "revising and remaking through critical reflection". Academic 04 (Cycle I) described the experience as "inspiring and innovative", while Academic 02 (Cycle II) noted that combining live sessions with other curated materials allowed for deeper understanding. Academic 05 (Cycle II) praised the competence of the team and the format of the Portal, valuing the integration between live discussions and final curated texts.

Discussion

The findings of this study provide empirical support for the theoretical premise that digital storytelling (DST) and digital curation (DC) act as complementary strategies for pedagogical professional development (PPD). By situating academics as both narrators and curators of their teaching practices, the OBSERVA Portal enabled processes of reflection, collaboration, and knowledge building that resonate with prior research on the role of digital culture in higher education (Flintoff et al., 2014; Vosgerau & Meyer, 2023).

The first set of findings, centred on innovation, revealed the pedagogical practices that academics valued and chose to share publicly. These practices ranged from technological applications to socially engaged projects and educational methodologies. This supports the argument by Chagas et al. (2019) and Schneider & Vosgerau (2023) that innovation in teaching cannot be reduced to the adoption of tools alone but involves creating inclusive, participatory, and humanised learning environments. By curating and disseminating these innovations, academics not only made their practices visible but also reinforced the value of experiential knowledge as a legitimate component of professional learning.

The second set of findings highlighted collaborative engagement as a pathway to professional development. The emphasis placed by participants on sharing spaces, perceived benefits, and extended reach demonstrates that DC within the OBSERVA Portal facilitated a shift from individual reflection to collective growth. This aligns with perspectives that regard PPD as an inherently collaborative endeavour (Bozu et al., 2009; Passos et al., 2020). As shown in earlier studies (Meyer & Vosgerau, 2020; Wagner & Souza, 2022), peer collaboration enhances professional agency and supports the co-construction of pedagogical knowledge. In the context of digital networks, this collaborative dimension is amplified by the potential for practices to circulate beyond the classroom, contributing to broader academic communities.

The third set of findings focused on academics' perceptions of their participation in the digital curation process. Here, reflection, awareness, and empathy emerged as critical dimensions, underscoring the affective and socio-emotional aspects of professional growth. The sense of appreciation and empowerment reported by participants illustrates the motivational potential of being recognised as knowledge producers, while co-authorship and validation through curated references bridged theory and practice. These results resonate with research on DST as a reflective and humanising practice (Gachago & Livingston, 2020; Rosales-Statkus & Roig-Vila, 2017), while also confirming the role of DC as a mechanism for ensuring credibility and fostering deeper engagement with educational content (Albertson & Johnston, 2021; Mihailidis, 2015).

Taken together, the findings demonstrate that the intersection of DST and DC within the OBSERVA Portal fostered a model of PPD that is dialogical, networked, and participatory. This model moves beyond traditional top-down approaches by recognising academics as co-authors of pedagogical knowledge. At the same time, the challenges identified—particularly regarding time constraints and the need for rigorous curation—point to structural conditions that must be addressed if such initiatives are to be sustained and scaled.

In sum, the findings show that the integration of digital storytelling and digital curation within the OBSERVA Portal generated a form of professional development that is collaborative, reflective, and grounded in practice. The results point to both the potential and the challenges of such initiatives, underscoring the importance of institutional support, peer recognition, and the development of digital competencies. Building on this interpretation, the next section presents the study's conclusions, implications, and suggestions for future research.

CONCLUSION, IMPLICATIONS AND SUGGESTIONS

This study examined the intersection of digital storytelling and digital curation in supporting professional development among Brazilian academics through the OBSERVA Portal. The findings show that, within the Portal, digital curation goes beyond the management of content and is consolidated

as a structured process of professional development. Participation in curation exposed academics to technological, social, and educational innovations, while also fostering collaborative engagement that supported reflection and the deepening of pedagogical practice.

The results confirm that peer collaboration is a cornerstone of this development, encouraging critical reflection, awareness of teaching practice, and the development of empathy. Dedicated spaces for sharing experiences, together with the wider dissemination of practices beyond the classroom, were perceived as direct benefits that enhanced professional development and reinforced a sense of community among academics.

Digital curation within the OBSERVA Portal—particularly through co-authorship and the personalisation of pages—proved to be a meaningful tool for professional growth. Satisfaction with the experience, the quality of the materials produced, and the recognition of contributions were key factors sustaining engagement. Feeling valued and empowered by the visibility of their practices and their influence on colleagues motivated participants to pursue further opportunities for development.

Nevertheless, the study faced limitations. Academics' restricted availability of time posed challenges to consistent participation in the curation process. In addition, the need for rigorous curation remains essential to ensure the reliability and relevance of content in the context of the large volume of information circulating on digital social networks.

These findings carry important implications for both practice and research in professional development. First, they underline the need for professional development models that recognise teaching expertise and prioritise peer collaboration. Second, they highlight the importance of investing in infrastructure and support teams to facilitate curation processes, thereby reducing workload pressures on academics. Third, they point to the relevance of integrating digital literacy and information curation as core competencies within professional development.

Future research should include longitudinal studies to examine the longer-term impact of participation in digital curation platforms on professional development. Comparative research across platforms and educational contexts could also strengthen understanding of the factors that support engagement and learning through curation. As a trusted environment, the OBSERVA Portal provides a relevant context for continuing these lines of investigation.

AUTHOR CONTRIBUTIONS (CRediT)

Dilmeire Sant'Anna Ramos Vosgerau: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Supervision, Validation, Visualization. Writing – original draft, Writing – review & editing. Caroline Carmona Marques Gonçalves: Conceptualization, Data curation, Formal Analysis, Investigation, Project administration, Writing – original draft, Writing – review & editing.

Author Notes

Based on Academic Integrity and Transparency in AI-assisted Research and Specification Framework (Bozkurt, 2024), the authors of this paper acknowledge that the paper was reviewed, edited, and refined with the assistance of ChatGPT (Version 4.0 – May 2024) and Grammarly Pro (2024), complementing the human editorial process. The human authors critically assessed and validated the content to maintain academic rigor. 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

Data Accessibility Statement

The datasets used and/or analysed during the current study are available by on ZENODO Database at: https://zenodo.org/records/16891074 .

Sustainable Development Goals (SDGs)

This study is linked to the following SDG(s): Quality education (SDG 4) and Partnerships for the goals (SDG 17).

Ethics and Consent

This project was registered with the Brazilian Ethics Committee (https://plataformabrasil.saude.gov.br/l) under number 45570221.0.0000.0020, approved as opinion 4,815,255 and can be consulted under the title “Mobilization via digital social networks for sharing innovative practices in higher education”.

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Indigenous Knowledge Transfer in the Age of AI: The Place of AI and Opportunities for Future Use In Indigenous-Centred Distance Education

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ABSTRACT

Although Māori have made great gains in utilising new mediums and technologies in connecting our communities back to their language, genealogy, history, culture and identity, the continuing challenge for many of our communities is what constitutes appropriate representation of Indigenous and other knowledge systems in higher education contexts. With the maturation of large-scale machine learning, deep learning, big data analysis, computational neural networks, AI, and other technologies, the issues of power, control, definition, and representation is of concern for Indigenous peoples. In an era of ever increasing neo-liberal pressure, Māori and Indigenous education and knowledge continues to be under siege from many sectors. The issue is, how do we ensure that these new technologies and the predominant western-approaches to their design and construction do not perpetuate marginalising discourses. In particular, what does increased participation and appropriate approaches to teaching and learning, assessment, and quality standards look like for Māori and Indigenous programmes located within a university setting.

Keywords

Māori; Indigenous; AI; AI Protocols; Distance education; e-learning; Māori studies; Māori language ITE programmes; Te Rūnanga Nui o Ngā Kura Kaupapa Māori o Aotearoa; Indigenous Data Sovereignty

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INTRODUCTION

With the maturation of large-scale machine learning, deep learning, big data analysis, computational neural networks, AI, and other technologies, the issues of power, control, definition, and representation are of concern for Indigenous peoples. The transition from analogue platforms to the digital 'Fourth Industrial Revolution' is at hand and the lines between the physical, biological, and digital realm has fundamentally "changed how people live their lives, study, work, write, and interact with each other" (Whaanga & Mato, 2021, p. 447). Platforms and social networking apps like TikTok, YouTube, Facebook, Instagram, LinkedIn, Twitter, Pinterest, Messenger, WhatsApp, Reddit and Snapchat, and Virtual Reality platforms like Meta (with its Quest line), Sony (PlayStation VR2), Valve (SteamVR/Index), and HTC (Vive) are the preferred method for accessing content and knowledge. There are literally billions of users interacting with and influencing each other and sharing content for the generation born as 'digital natives' or 'virtual natives' (see, for example, Akçayır, Dündar & Akçayır 2016; Kirschner & De Bruyckere 2017; Henry & Shannon, 2023; Prensky, 2001, 2009; Yong & Gates 2014).

Whether we like it or not, digital technologies and AI are part and parcel of the everyday lives of Indigenous peoples and are defined variously as comprising the "advanced digital technologies that enable machines to reproduce or surpass abilities that would require intelligence if humans were to perform them" (AI Forum of New Zealand, 2018 as cited in Walters & Kukutai, 2018, p. 2). In response to the increase in access and accessibility of Indigenous content, data, information, and resources, there is a growing concern amongst educators, academics, and cultural leaders about the ethicality surrounding the use of AI and digitally born technologies. And particularly the applicability of Indigenous data sovereignty in the academy as an essential part of cultivating equitable education systems. As Walter and Kukutai (2018) maintain,

> AI and machine learning are data driven which rely on ongoing access to data. But data are not just a free-floating phenomena. While increasingly electronic in form they have an underlying reality… a tangible value as a cultural, strategic and economic resource. (p. 8)

Therefore, the ethical use of Indigenous content, data, information and resources has significant implications for the provision of Indigenous distance education.

Indigenous peoples have a long history of technological advances being used against them (Arnold, 2005; Guiliano & Heitman, 2019; Walter & Suina, 2019) and therefore it is of vital importance that we engage with this latest technological paradigm shift in our own best interests. If we choose to ignore the value of AI generally and within the delivery of distance education in particular, these conversations will "continue to be dominated by the relatively culturally homogeneous research labs and Silicon Valley start-up culture defined through a Western techno-utilitarian lens" (Brown, Whaanga & Lewis, 2023, para 4). Furthermore, the use of algorithms in the academy is a new face of colonisation (Whaanga, 2020). Thus, mediation is required around questions such as:

- Who owns the data?
- How should the data be accessed, who should have access and under what circumstances?
- On what basis should this access be supported?
- How should data be used?
- Who decides all matters to do with access, control, ownership, use and value of data?
- What is at stake in cultivating equitable education systems for the 21st Century?

INDIGENOUS KNOWLEDGE

Any interpretation, theories and concepts of reality by Indigenous peoples that describe our world cannot be organized under the rubric of a single organising concept because there is no universal indigeneity. As Youngblood Henderson has argued "Indigenous peoples are attempting to effect a paradigm shift to replace the Eurocentric way of viewing the world with a new context that would be an ecological or natural context of Indigenous Knowledge rather than a refined artificial one" (2000, p. 14). Customarily Indigenous knowledge was generated through oral tradition because the nature of Indigenous languages is embedded within a deep knowledge of the land, the flora and fauna, and the existential experiences of particular groups of people. Thus, the production of knowledge is neither fragmented or alienated from our realities, but intimately linked to the interrelatedness of things such as between people, their environment, the metaphysical world and time and place (Deloria, 1995). The intention of this paper is to locate the global ethical context of AI alongside a consideration of increased participation and appropriate approaches to teaching and learning, assessment, and quality standards for Māori and Indigenous distance education programmes located within a university setting. An underlying premise is the assumption that Indigenous peoples share worldviews and philosophical orientations that are compatible and that we share mutual respect for the distinct and uniqueness of each other's knowledge systems. Understanding the ethicality of a phenomena from a Māori or Indigenous standpoint, is important because it involves more than a considered focus on the principles of respect, truth, minimizing harm, informed consent, respect for privacy and confidentiality that form the ethical procedures of institutional ethics committees for example (e.g., Massey University Code of Ethical Conduct). These principles are important and are taken into account. However, what is just as important in the provision of distance education, are those principles associated with mātauranga Māori and tikanga Māori (that which is right and correct), te reo Māori (Māori language), mana Māori (Māori control), mana tangata (upholding the dignity of the individual and collective), mana motuhake (ownership and control of information), and whakatuia (integrating links between past and present, individual and the collective (Durie, 1997, p. 10).

Sir Hirini Moko Mead's explanation of mātauranga Māori provides a justification and the relevancy of the principles of ethicality for Māori as it applies to distance education in an AI environment, and at the centre is the significance of te reo Māori. According to him,

> ... mātauranga Māori…is the term we use today to identify and describe a fairly complicated knowledge system and its many whare (houses), that are its branches of knowledge. Te reo Māori … gives expression to mātauranga Māori and at the same time acts as a record-keeper of knowledge…a cultural knowledge system that is integrated into all parts of Māori culture. (Mead, 2025, pp. xvi-1).

Customarily, knowledge has always been highly valued where particular types of knowledge were tightly controlled and regulated, so that secrecy and imposed sanctions were the norm. Knowledge was perceived as hierarchical and the observation of tapu was a practical way in which specialised knowledge in particular, was protected. At all levels of knowledge production, knowledge distribution, and sharing, what was paramount was maintaining accuracy, accountability and correct usage because one's mana was at stake. Individually high stakes specialised knowledge contributed to a person's mana. At a collective level any mistakes or misuse of information had the potential to lessen the mana of an entire whānau, hapū or iwi (Tomlins-Jahnke, 2005).

For Māori, such customary attitudes to knowledge still prevail, and are therefore a mediating factor and key consideration in the selection of knowledge for curriculum, in determining the nature of course and programme offerings through distance education, and the basis upon which quality standards are measured and assessed. Defining what counts as appropriate representation of Māori knowledge systems, who defines what is taught and how, while ensuring access to learning through distance education in a neo-colonial AI context. These are significant concerns for Indigenous scholars in our struggle for control and protection of our collective knowledge. Māori and Indigenous education remains under siege as a result of this global era of heightened neo-liberal pressure resulting in fragile democracies that undermine their stability and effectiveness.

In Aotearoa New Zealand, the systematic stripping away of Māori rights by the current Coalition Government (National, NZ First, Act Parties) is a case in point. The outcomes of the Government's rigorous adherence to its neo-liberal policies have resulted in a detrimental impact on Māori thereby exacerbating existing socio-economic disparities across every level of society. Such negative impacts include attacks on Māori housing, Māori health, Māori education, Māori land and resources, Māori language, Te Tiriti o Waitangi, and all Māori led initiatives. In the provision of distance Māori education, this situation portends yet a further level of complexity and instability in terms of access, participation and resourcing.

TE PŪTAHI A TOI–SCHOOL OF MĀORI STUDIES

We deliver distance education through Te Pūtahi a Toi, School of Māori Studies. As a long and well-established academic discipline in Aotearoa New Zealand, Māori studies encompasses a wide range of subjects including language, history, culture, philosophy, politics, and social systems of Māori people. Within the discipline the emphasis is on a scholarly approach to these areas, with research, critical thinking, and systematic inquiry that goes beyond merely acquiring knowledge. Instead, what is offered in distance education is a comprehensive, trans-disciplinary approach to understanding Māori society, rather than just the transmission of knowledge itself.

While Māori Knowledge (or Mātauranga Māori) often refers to the body of traditional knowledge, practices, and values that have been passed down through generations, Māori Studies provides a broader framework. It includes an exploration of how this knowledge intersects with contemporary issues, how it adapts to modern contexts, and how it is expressed in scholarly and public spheres.

An important aspect of Māori Studies is that it acknowledges the cultural and intellectual systems of Māori society, drawing on the traditions of Indigenous scholars worldwide and offering a platform for Māori and Indigenous voices, perspectives, and worldviews while emphasizing critical analysis, discussion, and engagement. Scholars in Māori Studies not only document Māori and (where appropriate) Indigenous knowledge, but also critically engage with it, exploring its applications, its implications for social justice, and its place in a neo-colonial world.

As a discipline Māori Studies aligns closely with the academic and institutional frameworks that support the legitimacy of Māori intellectual traditions in universities and research institutions. It recognises Māori knowledge as part of a wider, legitimate body of scholarship, ensuring that the knowledge is studied, respected, and presented with due academic rigor. Overall, it encompasses the full scope of the intellectual engagement with Māori culture, society, and knowledge systems, acknowledging both the complexity and modern relevance of these traditions. In the process Māori

Studies promotes a rigorous, respectful, and inclusive understanding of Māori and Indigenous ways of knowing and being.

What then are the responsibilities and challenges we face in providing distant education locally, nationally and internationally in the context of new technologies, ensuring they do not perpetuate marginalising discourses?

INDIGENOUS AND MĀORI DATA SOVEREIGNTY

In 2011, the World Economic Forum drew a comparison between data and oil stating that "data will be the new oil" (Schwab et.al, 2011). As noted by Stach (2023, p. 1), "this metaphor is intended to express not only that the commodity 'data' has a steadily growing economic value but also that this commodity is becoming one of the most important drivers in the industrial world". The importance and significance of data, data reclamation, rights and sovereignty have not been lost on our Indigenous communities with a number of examples happening across many nations including Australia via the Maiam nayri Wingara Indigenous Data Sovereignty Collective, the United States through the United States Indigenous Data Sovereignty Network, and in Aotearoa New Zealand through Te Mana Raraunga as the Māori Data Sovereignty Network. Forming the foundations and building on to these discussions are the First Nations Principles of Ownership, Control, Access and Possession (OCAP) (FNIGC, 2015) and CARE Principles for Indigenous Data Governance (CARE) (Carrol et al. 2020; RDAIG, 2019). Indigenous approaches to data access, use and management, and sovereignty (Kukutai & Cormack, 2019; Kukutai & Taylor, 2016; Walter & Suina, 2019), are founded on the rights of Indigenous peoples to "determine the means of collection, access, analysis, interpretation, management, dissemination and reuse of data" (Walter, 2018 online). These collective rights to data about, on and created by Indigenous peoples, their territories, and resources "is supported by Indigenous peoples' inherent rights of self-determination and governance over their peoples, country and resources as described in the United Nations Declaration on the Rights of Indigenous Peoples" (Walter & Suina, 2019, pp. 236–237).

Te Mana Raraunga (2018) presents a set of Māori Data Sovereignty principles defining Māori data as digital or digitisable information or knowledge that is about or from Māori people, our language, culture, resources or environments. Māori Data Sovereignty emphasises the inherent rights and interests that Māori have in relation to the collection, ownership, and application of Māori data. Māori Data Governance concerns the principles, structures, accountability mechanisms, legal instruments and policies through which Māori exercise control over Māori data. Advocating for the realisation of Māori rights and interests in data, and for the ethical use of data to enhance the wellbeing of our people, language and culture, the Māori Data Sovereignty principles are set out under six key principles: Rangatiratanga | Authority; Whakapapa | Relationships; Whanaungatanga | Obligations; Kotahitanga | Collective benefit; Manaakitanga | Reciprocity; Kaitiakitanga | Guardianship (presented below in Table 1).

Table 1: Māori Data Sovereignty principles (Te Mana Raraunga, 2018)

Principle	
Rangatiratanga | Authority	● **Control**. Māori have an inherent right to exercise control over Māori data and Māori data ecosystems. This right includes, but is not limited to, the creation, collection, access, analysis, interpretation, management, security, dissemination, use and reuse of Māori data. ● **Jurisdiction**. Decisions about the physical and virtual storage of Māori data shall enhance control for current and future generations. Whenever possible, Māori data shall be stored in Aotearoa New Zealand. ● **Self-determination**. Māori have the right to data that is relevant and empowers sustainable self-determination and effective self-governance.
Whakapapa | Relationships	● **Context**. All data has a whakapapa (genealogy). Accurate metadata should, at minimum, provide information about the provenance of the data, the purpose(s) for its collection, the context of its collection, and the parties involved. ● **Data disaggregation**. The ability to disaggregate Māori data increases its relevance for Māori communities and iwi. Māori data shall be collected and coded using categories that prioritise Māori needs and aspirations. ● **Future us**e. Current decision-making over data can have long-term consequences, good and bad, for future generations of Māori. A key goal of Māori data governance should be to protect against future harm.
Whanaungatanga | Obligations	● **Balancing rights**. Individuals' rights (including privacy rights), risks and benefits in relation to data need to be balanced with those of the groups of which they are a part. In some contexts, collective Māori rights will prevail over those of individuals. ● **Accountabilities**. Individuals and organisations responsible for the creation, collection, analysis, management, access, security or dissemination of Māori data are accountable to the communities, groups and individuals from whom the data derive.
Kotahitanga | Collective benefit	● **Benefit**. Data ecosystems shall be designed and function in ways that enable Māori to derive individual and collective benefit. ● **Build capacity.** Māori Data Sovereignty requires the development of a Māori workforce to enable the creation, collection, management, security, governance and application of data. ● **Connect**. Connections between Māori and other Indigenous peoples shall be supported to enable the sharing of strategies, resources and ideas in relation to data, and the attainment of common goals.
Manaakitanga | Reciprocity	● **Respect**. The collection, use and interpretation of data shall uphold the dignity of Māori communities, groups and individuals. Data analysis that stigmatises or blames Māori can result in collective and individual harm and should be actively avoided. ● **Consent**. Free, prior and informed consent (FPIC) shall underpin the collection and use of all data from or about Māori. Less defined types of consent shall be balanced by stronger governance arrangements.
Kaitiakitanga | Guardianship	● **Guardianship**. Māori data shall be stored and transferred in such a way that it enables and reinforces the capacity of Māori to exercise kaitiakitanga over Māori data. ● **Ethics**. Tikanga, kawa (protocols) and mātauranga (knowledge) shall underpin the protection, access and use of Māori data. ● **Restrictions**. Māori shall decide which Māori data shall be controlled (tapu) or open (noa) access.

DEVELOPING PROTOCOLS: AN INTERNATIONAL PERSPECTIVE

In the past few years, Australia, Canada, China, Denmark, the EU Commission, Finland, France, Germany, India, Italy, Japan, Kenya, Malaysia, Mexico, Aotearoa New Zealand , Nordic-Baltic Region, Poland, Russia, Singapore, South Korea, Sweden, Taiwan, Tunisia, United Arab Emirates, and the United Kingdom have released declarations, strategies and guidelines to promote the use and development of AI (see Dutton, 2018 and Hudson, 2024 for an overview). Released by nation-states, corporations, and public and private organisations these documents are primarily premised on establishing global principles and standards, corporate governance and compliance, industrial competitiveness and sustainable development (Brown, Whaanga & Lewis, 2023), with a focus on "scientific research, talent development, skills and education, public and private sector adoption, ethics and inclusion, standards and regulations, and data and digital infrastructure " (Dutton, para. 1). As noted by the IEEE (2017), these standards and regulations outline the common good and benefit for humanity. They establish principles of fairness and intelligibility, address data and privacy rights, and they propose benefit sharing and restrictions or outright bans on vesting AI with the autonomous power to hurt, destroy, or deceive humans.

However, with many of these early documents is the general "absence of Indigenous voices and a lack of Indigenous perspectives in the development and construction of these declarations and manifestos" (Brown, Whaanga & Lewis, 2023, para 4). More recently, there has been an acknowledgement of the importance of maintaining well-being, equity, self-determination, algorithm uses, and Indigenous data sovereignty. Alongside of which is a growing Indigenous voice in Australia, Canada, Hawaii, Aotearoa New Zealand and the USA (e.g., Gavaghan et al. 2019; Lewis, 2020; Royal Society Te Apārangi, 2025; Walsh et al. 2018). However, none of these have considered the ethical implications and impacts of AI on the provision of distance education on Māori and Indigenous communities.

The guidelines produced by the Royal Society Te Apārangi (2025) are framed by the recognition of te Tiriti o Waitangi, fairness, equity of access, and consideration of diverse perspectives and users. The guidelines note that "Research in Aotearoa New Zealand is informed by obligations to te Tiriti o Waitangi … and to the tikanga of te ao Māori, the Māori worldview. Protection of taonga Māori, which includes te reo Māori, mātauranga Māori, and Māori data, is of key importance... Kaupapa Māori rangahau is tikanga led and community focused" (p. 3). It then articulates that responsible and ethical use of GenAI in research, researchers should take account of the following (pp. 5-7):

> 3.2.1 Acknowledge and respect that Māori data, including mātauranga Māori and te reo Māori, are taonga that Māori have Te Tiriti o Waitangi-afforded rights to govern and protect.
>
> - Researchers' decisions about the use of GenAI adhere to principles of Māori data sovereignty
> - Researchers using GenAI tools that incorporate Māori data are responsible for ensuring that no GenAI tool will assume any proprietary interest of Māori data, including mātauranga Māori and te reo Māori.
> - Researchers with intentions to commercialise any outcome from the use of a GenAI tool that incorporates Māori data require free prior informed consent from Māori kaitiaki on access and use of the Māori data, and fair and equitable benefit-sharing terms (Royal Society Te Apārangi, 2025, p. 5).
>
> 3.2.4 Pay particular attention to issues related to:

- data sovereignty. This includes Māori data sovereignty, Pacific data sovereignty, and Indigenous data sovereignty
- privacy
- confidentiality
- intellectual property rights when sharing sensitive or protected information with GenAI tools (p. 6)

3.2.5 Respect applicable New Zealand legislation and Waitangi Tribunal recommendations, as well as international legislation, as in regular research activities

- The output produced by GenAI should be sensitive to the legal protection of intellectual property rights and personal data.
- The Waitangi Tribunal reports WAI 2522 and WAI 262 have recommendations that refer to obligations associated with the protection of mātauranga Māori, including Māori data and te reo Māori.
- When using outputs from GenAI, researchers pay attention to the potential for plagiarism (text, code, images, etc). Researchers validate the sources of information and respect others' authorship, citing work where appropriate.
- Consideration should be given to international legal frameworks and principles, such as the United Nations Declaration on the Rights of Indigenous Peoples (21) and obligations to the protection of Indigenous knowledge, including Indigenous data and Indigenous languages (see Article 31 (21). (Royal Society Te Apārangi, 2025, p. 6).

The Indigenous Protocols AI (IP-AI) guidelines (Lewis, 2020) grew out of two workshops held in 2019, that brought together members of Kanaka Maoli, Māori, Trawlwoolway, Euskaldunak, Baradha, Kapalbara, Samoan, Cree, Lakota, Cherokee, Coquille, Cheyenne, and Crow communities from across North America, Oceania, and New Zealand Aotearoa and Australia. Held on Kanaka Maoli territory, on the Hawaiian island of Oʻahu, thirty-five Indigenous and non-Indigenous individuals participated in the workshops (Brown, Whaanga & Lewis, 2023; Lewis, 2020; Yolgormez, Lewis, & Whaanga, 2025). These two workshops brought together a range of technologists, artists, scientists, cultural knowledge experts, language experts, and public policy experts from a variety of disciplinary backgrounds. Such disciplines included machine learning, design, symbolic systems, cognition and computation, visual and performing arts, philosophy, linguistics, anthropology, and sociology (Brown, Whaanga & Lewis, 2023). The purpose of the gathering was to build on earlier work conducted on IP-AI such as, Abdilla and Fitch's (2017) pattern thinking in Aboriginal Songlines for orally mapping territory and the pattern recognition developed by roboticists; Kesserwan's (2018) Innu's concepts of non-human agency as a better fit for AI into our human contexts; and Lewis' et al. (2018), work on Kānaka Maoli, Nēhiyaw, and Lakȟóta relational frameworks to understand how AI systems might be placed within the circle of human and other-than-human relationships. A further focus was to critically examine and discuss the relationship between AI and Indigenous communities around the following questions:

1. Should AI be given a place in our existing circle of relationships, and, if so, how might we go about bringing it into the circle?
2. How can Indigenous epistemologies and ontologies contribute to the global conversation regarding society and AI?
3. How do we broaden discussions regarding the role of technology in society beyond relatively culturally homogeneous research labs and Silicon Valley start-up culture?

4. How do we imagine a future with AI that contributes to the flourishing of all humans and nonhumans?

The purpose of the IP-AI guidelines was to assist and guide the development of AI toward morally and socially desirable ends. They are offered, as Brown, Whaanga and Lewis (2023) note, "to any person, group, organization, institute, company, and political or government representative that wishes to undertake responsible and fair development of AI with Indigenous communities. This responsibility includes, among other things, contributing to scientific or technological progress, project development, rules and regulations, codes of conduct and algorithm development, methodological approaches, and public opinion". In total, seven principles were developed from the broader discussions with the IP-AI participants. Even though these guidelines are presented as a list (see Table 2), there is no hierarchy in the ordering. The first principle is no less important or more highly weighted than the final one in the list (Lewis, 2020, pp. 19-22).

Table 2: Guidelines for Indigenous-centred AI Design (Lewis, 2020)

Principle	
Locality	Indigenous knowledge is often rooted in specific territories. It is also useful in considering issues of global importance. ● AI systems should be designed in partnership with specific Indigenous communities to ensure the systems are capable of responding to and helping care for that community (e.g., grounded in the local) as well as connecting to global contexts (e.g., connected to the universal).
Rationality and reciprocity	Indigenous knowledge is often relational knowledge. ● AI systems should be designed to understand how humans and nonhumans are related to and codependent on each other. Understanding, supporting, and encoding these relationships is a primary design goal. ● AI systems are also part of the circle of relationships. Their place and status in that circle will depend on specific communities and their protocols for understanding, acknowledging, and incorporating new entities into that circle.
Responsibility, relevance and accountability	Indigenous people are often concerned primarily with their responsibilities to their communities. ● AI systems developed by, with, or for Indigenous communities should be responsible to those communities, provide relevant support, and be accountable to those communities first and foremost.
Develop governance guidelines from Indigenous protocols	Protocol is a customary set of rules that govern behavior. ● Protocol is developed out of ontological, epistemological, and customary configurations of knowledge grounded in locality, relationality, and responsibility. ● Indigenous protocol should provide the foundation for developing governance frameworks that guide the use, role, and rights of AI entities in society. ● There is a need to adapt existing protocols and develop new protocols for designing, building, and deploying AI systems. These protocols may be particular to specific communities, or they may be developed with a broader focus that may function across many Indigenous and non-Indigenous communities.
Recognize the Cultural Nature of All	All technical systems are cultural and social systems. Every piece of technology is an expression of cultural and social frameworks for understanding and engaging with the

Computational Technology	world. AI system designers need to be aware of their own cultural frameworks, socially dominant concepts, and normative ideals; be wary of the biases that come with them; and develop strategies for accommodating other cultural and social frameworks. ● Computation is a cultural material. Computation is at the heart of our digital technologies, and as more of our communication is mediated by such technologies, it has become a core tool for expressing cultural values. Therefore it is essential for cultural resilience and continuity for Indigenous communities to develop computational methods that reflect and enact our cultural practices and values.
Apply Ethical Design to the Extended Stack	Culture forms the foundation of the technology development ecosystem or "stack". Every component of the AI system hardware and software stack should be considered in the ethical evaluation of the system. This starts with how the materials for building the hardware and for energizing the software are extracted from the earth and ends with how they return there. The core ethic should be that of do-no-harm.
Respect and support data sovereignty	Indigenous communities must control how their data is solicited, collected, analyzed, and operationalized. They decide when to protect it and when to share it, where the cultural and intellectual property rights reside and to whom those rights adhere, and how these rights are governed. All AI systems should be designed to respect and support data sovereignty. ● Open data principles need to be further developed to respect the rights of Indigenous peoples in all the areas mentioned above and to strengthen equity of access and clarity of benefits. This should include a fundamental review of the concepts of "ownership" and "property," which are the product of non-Indigenous legal orders and do not necessarily reflect the ways in which Indigenous communities wish to govern the use of their cultural knowledge.

DESIGNING RESPONSIVE DISTANCE EDUCATION PROGRAMMES: TE AHO TĀTAIRANGA AND TE AHO PAEREWA

The issue is, how do we ensure that these new technologies and the predominant western approaches to their design and construction do not perpetuate marginalising discourses. In particular, what does increased participation and appropriate approaches to teaching and learning, assessment, and quality standards look like for Māori and Indigenous distance education programmes located within a university setting. Our experiences in the development, co-construction and provision of Te Aho Tātairangi and Te Aho Paerewa; two Māori immersion initial teacher education programmes, through a blended, distance education model, in partnership with Te Rūnanga Nui o Ngā Kura Kaupapa Māori (the Māori immersion school community governing organisation) is a case in point. The significance of this community partnership is premised on the power and autonomy of Te Rūnanga Nui o Ngā Kura Kaupapa Māori (TRN) to make decisions about what counts in the education of Māori learners in the kura kaupapa Māori system of schooling in Aotearoa New Zealand. This level of autonomy has led to high rates of achievement and success for graduates of kura kaupapa Māori in gaining relevant qualifications to enter higher education. Such outcomes contrasts with the marginalisation and high underachievement of Māori students in mainstream schooling evident in sustained high suspension, truancy and dropout rates which do not exist in the kura kaupapa Māori system (Tomlins-Jahnke, 2024).

To maintain a level of autonomy required to ensure the sustainability and successful community/institution partnership, the two ITE programmes were purposefully situated within the School of Māori Studies rather than in a Euro-centric College of Education. This was a political decision we made in order to maintain control of how the programmes are provided through distance and mixed mode to Māori communities while accounting for state legislation and university regulations. In Aotearoa New Zealand, there are few university based Indigenous centred degree programmes, due in large part to Eurocentric imperatives where Indigenous knowledge is subject to the wider politics associated with western hierarchies of knowledge in terms of what counts as valid knowledge? Whose knowledge counts, who decides, and on what basis? In establishing an authentic partnership with TRN in the preparation of graduate teachers, it required the university taking into account the aspirations of their communities, including the proviso that student teachers are prepared through the medium of the Māori language only, and that the programme would be underpinned by the legislated education philosophy of Te Aho Matua. The initial decision by TRN to enter a partnership with Massey required a significant mind shift by its members and community, that their aspirations for mitigating the severe issue of teacher supply for their sector could be met by a perceived Eurocentric institution. The history of colonial and neo-colonial education perpetrated on Māori since first contact has resulted in a deep distrust among the Māori community of western/Eurocentric institutions. Universities in particular are seen to wield the power to decide on what knowledge counts and the Eurocentric systems they support and perpetuate (Tuhiwai Smith, 1999, Tomlins-Jahnke, 2019). It has therefore required a high level of trust on the part of TRN, through holding the institution to account and by Massey enacting a genuine partnership.

The normalising of Māori language, culture, knowledge and values within kura kaupapa Māori has called for an alternative model of ITE provision, through distance and mixed mode. Factors underpinning this alternative model are several key principles relative to the provision of distance education, that have contributed to the acceptability of the model by the Kura Kaupapa sector and to the strength of the programmes as a necessary alternative that is transforming the lives of the graduates, their whānau and their wider community.

The principle of partnership has been a key factor in the relationship between the institution and the community, as well as the success of the programmes. There is a small pool of expert practitioners located in kura kaupapa Māori who are leading the field of kaupapa Māori immersion education. Access to these experts for the development and provision of kura kaupapa Māori ITE has been achieved through the partnership which has been integral to conceptualising, co-constructing and delivering the two programmes via distance and mixed mode for over a decade. This has included collaborating on the choices involved in developing the curriculum, choosing what knowledge counts, and choosing relevant assessment models concomitant with te ao Māori ontologies, values and customs. This community partnership model for delivering immersion Māori ITE via distance, is the only one of its kind in the country, and is a pragmatic and positive solution to increasing Māori teacher supply for the Māori medium sector. An important factor for the community supporting the programmes has been the strong relationships with Māori faculty that have been built over many years. All the Massey faculty involved in teaching in the programmes are either a graduate of Kura Kaupapa Māori, have taught in a kura, have established a kura and been a principal. And all faculty are actively involved in their tribal communities. This has been central to lending the institution its credibility among the community as a trustful partner.

The principle of access and participation through mixed modality has been achieved through the university's virtual teaching and learning platform, Stream. From the outset, TRN recognised the advantage of utilising the institutions' vast distance learning facilities, thus access supported their vested interest in ensuring a well-qualified workforce and an increased and sustainable teacher supply (Tomlins-Jahnke, 2019). We are the only provider to successfully maintain a national reach for kaupapa Māori ITE. Offering the programmes through Stream has allowed greater access and participation for Māori students located across Aotearoa New Zealand, without the need to relocate to the university, but remain within the supportive environment of their whānau. While some kura kaupapa graduates survive the challenges of university, many high achievers do not, experiencing the university as impersonal, alienating and isolating. Thus, the distance option offers an optimum opportunity for students to complete their degrees. Distance mode through Stream has meant a heavy reliance on new computer-based technologies and mobile devices. This has meant teaching staff in particular, training in new technology programmes translating resources into the Māori language and adapting them to be culturally responsive to immersion Māori ITE. The students' preference for communicating with staff and each other via restricted sites on social media platforms has been a challenge, especially in mitigating an otherwise sterile university virtual platform, and approximating our online offerings with a competing social media environment. We have also been mindful that the preferred pedagogical approach to learning and teaching within a kaupapa Māori context is what is referred to as 'kanohi ki te kanohi' meaning 'a face seen' or face to face delivery. To account for this several weeklong face-to face contact courses or wānanga are held at the university which supplement the distance mode offerings.

The principle of field-based support is offered when students are selected and enter the programmes, where they are assigned a kura hāpai, most often the kura they attended as pupils. The benefit of the kura hāpai is that they volunteer to host the students for the duration of their studies offering a professional and family centred environment, including internet and computer access if necessary. Many of the students are rural based with limited or no access to the internet upon which the two programmes depend for the delivery of teaching and learning content. An important outcome of this arrangement has been an increase in the retention of students studying at a distance.

The principle of quality and assurance involves the regular university systems and the state accreditation body of the New Zealand Teaching Council. However, quality assurance and excellence includes providing an annual report to the national gathering of the kura kaupapa sector and regular reports to TRN. Quality assurance and excellence includes Māori language proficiency, the quality and relevancy of assessments within kaupapa Māori contexts and the governance of the programmes in accordance with Māori customs and values. Assessments include participation by the community in measuring quality and excellence across a number of curriculum domains either face to face and/or via VTL.

CONCLUSION: THE PLACE OF AI AND OPPORTUNITIES FOR FUTURE USE IN INDIGENOUS-CENTRED DISTANCE EDUCATION

The questions are whether AI has a place and future use in Indigenous-centred distance education? And if so, what are the protocols required to ethically build an AI system that align with the values of kura kaupapa Māori? Since 2020, and as a response to Covid 19, most tertiary institutions in Aotearoa New Zealand have turned to delivering e-learning, or distance education within which AI has been

integrated that has served to augment and enhance teaching strategies aimed at engaging students in a variety of interesting ways (Tuczyński, 2024, p. 883). Tuczyński has outlined nine aspects (i.e., personalization; multisensory learning; pacing and flexibility; dynamic adaptation; individualization and teamwork; skill development; AI a partner; and challenges) that emphasise the benefits and strengths of an AI based pedagogical approach to e-learning that are relevant and can be applied to a kaupapa Māori immersion ITE programme. However, despite these benefits our experience of distance learning for Māori students generally, and the Kaupapa Māori Immersion ITE programmes in particular, mirrors the risks and challenges outlined by Tuczyński that include student isolation, unequal assessment criteria, disparities in technology access, and increased teacher workload (2024, p. 886). However, further to this is the challenge of infusing a Māori education philosophy of Te Aho Matua, which is the philosophical basis on which both programmes are grounded, within an e-learning/distance context. When exercising our protocols such as karakia to begin VTL sessions for example, the emotional responses evoked through the connection of the spiritual with the experiences and deep connections shared among students and staff, can often be lost when not experienced in person.

One area that will slow the development of the use of AI as a viable tool in the Māori medium sector is the amount and availability of quality data and teaching resources in te reo Māori. Te reo Māori is one of a number of low resourced Indigenous languages in the world (James et.al, 2025). These languages have not enjoyed the same amount of representation and attention as global languages (e.g., English, French, German, Chinese etc). In an ever more globalised society, languages become a commodity, an expression of power. Having data (in its broadest sense - including digital data or digitisable information or knowledge) to construct an AI tool must be under Indigenous control to ensure that we maintain our responsibilities and accountabilities to our communities. Our communities must control how our data is solicited, collected, analysed, and operationalised. Mechanisms and processes need to be established to protect our knowledge and data, when and why we are sharing it, where and whom the cultural and intellectual property rights reside and to whom those rights adhere, and how these rights are governed. Having and supporting data sovereignty in a teaching context in Aotearoa New Zealand is a complex issue. Māori currently do not have mass capacity and infrastructure to build or use AI tools. Apart from localised initiatives (James et.al, 2025), Māori tend to rely on international platforms, so control of knowledge and Māori data is compromised. In this scenario, there is, for example, the potential for Indigenous peoples to be exploited and charged costs to use and access their own knowledge that has been stored, and in some cases, appropriated by some unscrupulous operators of international data storage systems (Redden & Kwan-Lafond, 2023). Nonetheless, more and more data repositories are being set up by iwi/hapū/whānau in order to maintain sovereignty over how their mātauranga/ knowledge, stories, whakapapa, images, and resources are being used and accessed. For the Māori medium sector to maintain control, it will be necessary to set up their own data repositories and infrastructure in collaboration with an entity/ organiation that has similar values and is built on a strong trust relationship. The repository model should be built where there is a redundancy in the system, in other words, a series of alternative cloud systems to store and back up localised mātauranga of a schooling network for protecting the data.

The future of ethical distance education for Māori and Indigenous peoples in an AI environment is premised on an AI system that is morally and socially desirable, and that "promote the intergenerational transmission of knowledge, ceremony, and practice; to connect and enhance

Indigenous communities; and to frame our relationships to the land, sea, and skyscapes" (Brown, Whaanga & Lewis, 2023).

AUTHORS' NOTES

No AI was used in the production of this manuscript.

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Authors' Contribution

Hēmi Whaanga affiliates to Ngāi Tahu and Ngāti Kahungunu, and Huia Tomlins-Jahnke affiliates to Ngāti Kahungunu, Ngāti Toa Rangatira, Ngāi Tahu, Ngāti Hine. Both authors have read and agreed to the published version of the manuscript.

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This study is linked to the following SDG(s): Quality education (SDG 4), Industry, innovation and infrastructure (SDG 9), Reduced inequalities (SDG 10), Peace, justice and strong institutions (SDG 16).

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Digital Nomadism as a Didactic Pattern in Higher Education

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ABSTRACT

Higher Education is expected to deliver competences beyond pure science, specifically job- field oriented competences. Such competences enable graduates to perform successfully in certain work scenarios which goes beyond just technical competences and includes professional and global competences. Furthermore, education involves students' reflection about themselves, their goals, personalities and strengths. Therefore, higher education is looking at future work and life scenarios and tries to incorporate the required competences and learning outcomes into the content and didactics of educational programmes. This paper investigates the preparation of graduates for the life as digital nomads by creating learning scenarios which inherently include work patterns which are similar to the patterns used by digital nomads. The leading learning scenario in this contribution is the virtual cross-border project which combines learning outcome contributing to digital skills, project and team competence, international and intercultural competences and (self-)management skills including communication, presentation and negotiation. For this purpose, the paper analyses scenarios and typical personas in the emerging field of digital nomadism, derives the required competences, translates them into learning outcomes and describes learning situations and didactic patterns which deliver the competences. In order to create an authentic learning experience, the learning situations are scenarios from digital nomadism which allows including them in project-based learning in virtual cross-border projects. These learning situations are implemented and evaluated in a virtual cross-border Master School of European educational programmes in IT, project management, engineering and innovation.

Keywords

digital nomad; project-based education; virtual cross-border projects, virtual master school

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INTRODUCTION

The world of work is not only changing due to new topics (e.g., technologies, products), markets and industries, but also because of new patterns of work. The 9-to-5 corporate employee becomes less common and new patterns emerge, especially in new and innovative industries and sectors. The digital transformation is an important driver of this change. It enables working from anywhere at any time, in changing organizational contexts, with changing roles, tasks and responsibilities. Such work often follows self-paced, agile or project-oriented patterns. One pattern which is emerging with a high pace (especially since COVID) is the digital nomad (Cook, 2023), a specific way of work-life-integration.

Higher education is expected to prepare students not only for a scientific career but – mainly – for the job market and for a successful way through work and life. The expectations extend beyond learning scientific knowledge and skills (e.g., in a technology domain). A holistic approach to preparing for typical work situations is expected. At the same time, the patterns of higher education are changing, too. The young full-time student is less frequent, part time studies and continuous education become more relevant, and the trend is towards an individualized life-long learning journey which is predominately triggered by immediate need for specific competences. This trend increases the importance of so-called transversal competences or "soft skills" (while the debate clearly indicates that these "skills" are by no means "soft" skills but more comprehensive competences). Individual management of the learning trajectory is becoming important – in line with life, work and the career. Complex competences are not delivered by chalkboard teaching or reading books. Targeted learning situations (or settings) are needed where students have a certain learning experience which prepares them to become digital nomads.

Approaches in Higher Education which are targeting specifically the required competence for digital nomads do not exist to the best knowledge of the authors. A straightforward idea is to simulate work patterns of digital nomads in learning situations in higher education. This is a typical way of designing learning situations. Obvious similarities are the preparation of learners for project work by applying project-based learning (PjBL) (Ríos et al., 2010) or the preparation for virtual cross-border collaboration by Collaborative Online International Learning (COIL) or a combination of PjBL and COIL (Baizhanova et al., 2022). Especially for more advanced learners (e.g., Master students) the goal is to create relatively complex and unstructured learning situations where the solution is not yet known or obvious. Such learnings situations benefit from reflective elements which allow learners to understand their own behaviour and to learn from mistakes. Another goal is to make the learning situations as authentic as possible to create a realistic experience, a natural acceptance of the learning setting, an avoidance of artificial "acting" of the learners, and transfer into the own work-life situation.

Therefore, the approach of the authors is to use realistic settings from work and life of digital nomads as part of the learning situations and as part of the (collaborative) work of students on realistic tasks. This makes digital nomadism not only a pattern to learn about but also a pattern of how to learn and how to work on tasks and assignments. Meaning, like turning project-work into a didactic pattern in PjBL, the authors want to turn digital nomadism into a didactic pattern in higher education, with the goal to acquire the necessary competences for digital nomads. As said, to the best knowledge of the authors, this has not been done before. Nevertheless, the approach heavily borrows from the similar approaches to develop PjBL and COIL into didactic patterns.

From the viewpoint of the authors, it is an open scientific question if this approach makes sense. Therefore, the following chapters will describe a scientific research problem with this focus and the first steps to address it. For that purpose, the authors conduct an educational project funded by the European Union (EU) where such questions are highly relevant for the implementation of the EU Digital Education Action Plan (2021-2027) (European Commission, 2023) and other relevant strategies for the educational sector (for the project NomadTrail (Fachhochschule Dortmund, 2025b), see acknowledgement). The goal is to establish digital nomadism (or aspects of it) as a didactic pattern and as a pattern for learning and collaboration in learning. For this purpose, it is necessary to define and describe what is meant with digital nomadism as a didactic pattern and how this pattern can look like. Didactic patterns are derived from learning outcomes that should be generated by applying the didactics. Therefore, the experimental setup for investigating the usefulness of digital nomadism as a didactic pattern is a sufficiently complex learning setting in higher education. The following sections will present the patterns and experiments.

PROBLEM STATEMENT AND RESEARCH METHODS

The formulation of the problem statement for this research is based on a guiding hypothesis (H_1):

> *H_1: Digital nomadism is a source of useful didactic patterns and approaches, creating effective learning situations which deliver competences to learners which are valuable for future work-life settings, especially for the work-life integration of digital nomads.*

This hypothesis already implies that preparation of learners for digital nomadism makes sense and is important. Furthermore, it implies that the required competences for digital nomadism are at least to some extent different from other competences (e.g., delivered by PjBL or COIL) and that these specific competences can be delivered by dedicated didactic patterns. These assumptions are not necessarily true, and they are also discussed to some extent in this contribution, but they are treated as valid.

Based on hypothesis H_1, several research questions (RQ) can be formulated:

> RQ1: What are typical and maybe unique work situations of digital nomads? What are the specific competences needed for a successful life as a digital nomad?
>
> RQ2: Which learning situations can help to acquire such competences? And how different or how compatible are these learning situations with PjBL and COIL?
>
> RQ3: How can these learning situations be transformed into a didactic approach which fits to higher education, especially to international Master programmes?

To contribute (it's an early research phase) to the answers to these research questions, a mixed methods methodology is used which has an explorative character and includes elements of inductive

research. A core element of the research methodology is the concept development and the design of a learning experience (e.g., a course, a student project). The concept is reviewed by an expert panel and then implemented in the Master programmes of the consortium universities (see section 4) in a pilot teaching. This forms an educational experiment which is used for the evaluation and improvement of the concept. The research approach is borrowed from Design Science Research (DSR) (Dresch et al., 2015) where the work on the solution (concept) development, the design of artefacts (learning experiences), and the test and evaluation in an experiment are forming a research design where all steps contribute to the scientific findings. Specific scientific methods are chosen while progressing in the design and test work and the scientific findings are recorded throughout the process, mainly with qualitative methods (descriptions, diaries, reviews, interviews). This DSR process is described in the following chapters.

The next section puts the focus on RQ1 by deriving insights into concept of digital nomadism from an explorative and cursory literature review. 7 journal publications (Aroles et al., 2020; Bozzi, 2024; Cook, 2023; Henkens, 2025; Hensellek et al., 2021; Lacárcel, 2025; Šímová, 2023) of the past 5 years have been selected, containing literature reviews and interview results on the concept of digital nomadism. It needs to be noted that no literature was found about addressing digital nomadism in (higher education). Therefore, the journals come from other areas like tourism and leisure, new work and entrepreneurship.

This is followed by a section on competence-based and project-based education, including COIL and PjBL. The section is based on prior research of the authors and cites some of their work, including literature reviews, descriptions of the educational experiments and findings. Furthermore, the section describes the design, the pilot trial and the evaluation of first educational experiments on using digital nomadism as a didactic pattern in higher education. This addresses RQ2. The final section of the paper discusses the results in the light of RQ3 and delivers ideas and recommendations in this respect.

DIGITAL NOMADS – LITERATURE REVIEW

Digital Nomadism as an Emerging Pattern of Future Work and Life

The literature review was conducted by searching for the terms “digital nomad” and “digital nomadism” in the Scopus database and in Google Scholar. Furthermore, it was searched for the terms in connection with “education” and “didactic”, with no result. Furthermore, the search for literature on digital nomadism was refined by the search terms “skills” and “competences” which led to the selection of 3 papers on specific skills and competence requirements for digital nomads. As a remark, a lot of literature can be found where the term “digital nomad” is used for users and learners in distant education, online education and any kind of digital collaboration. Nevertheless, such literature was excluded since it does not extract competence requirements or dedicated didactic patterns for digital nomads as a work pattern.

Definitions and descriptions (e.g., a typology or taxonomy) of the digital nomad phenomenon are mainly found in journals on tourism, leisure and transportation since these sectors host digital nomads and consider them as a customer group. From such sources, an understanding of the persona of a digital nomad, their personality and their lifestyle can be derived. Journals on work and especially on innovative or entrepreneurial work view the digital nomad as a type of worker. From such articles, the typical work situations and their requirements can be derived. Cook (2023) defines a digital nomad as

a person which "uses digital technologies to work remotely, they have the ability to work and travel simultaneously, have autonomy over frequency and choice of location, and visit at least three locations a year that are not their own or a friend's or family home" (p. 259). This definition is supported by Henkens (2025), Hensellek et al. (2021), Lacárcel (2025), and Šímová (2023), where aspects like the "mobile lifestyle", the self-managed and self-paced work and the work-life-integration are emphasized.

A typology of digital nomads is constructed by Aroles et al. (2020) and Cook (2023) from literature reviews and interviews. Based on their findings, this contribution summarizes the typology as follows:

- The type of digital nomad which comes to mind first is the *self-employed freelance worker* who conducts projects and tasks for a variety of customers from several travel destinations, living there for short to medium-term periods. This type does work which can be conducted independently to some extent, self-paced and self-managed, e.g., web design, programming, online language teaching, translation, etc. Nevertheless, such freelance workers might be also part of (virtual) teams.

- Another important type is called "salaried digital nomads". They are *company employees which travel and work from abroad*. This type covers quite a broad range of work patterns. It starts from "normal" company employees which do for the one or the other reason a lot of business trips. Companies can require employees (e.g., service technicians) to work from various locations. Some of these patterns overlap with expatriate workers (expats) which work in a foreign country for a longer period. For cross-border project teams, it can make sense to relocate some team members for a period. The "salaried digital nomad" also overlaps with a work pattern which became very relevant in the past years: the home office worker. Some employers allow home office from other locations, sometimes from other countries (though facing legal constraints). In general, some work patterns of home office workers are similar to the ones of digital nomads. A major difference to the first type of digital nomads is the organizational embeddedness of salaried digital nomads.

- A third relevant group are *digital entrepreneurs* which work for various reasons from different countries. Cook (2023) calls them "business owners" since they can overlap with the freelancer type, especially if they are 1-person-companies. Nevertheless, there are differences in context of the work, e.g., it might be less possible to work only occasionally, and the required environment. Aroles et al. (2020) and Cook (2023) found that freelance workers call themselves entrepreneurs.

- Some other groups use the work-and-travel pattern, including students which travel and study from various places, long-time tourists which transit into remote work, digital nomads in larger countries (who do not travel abroad but within countries, e.g., the US) and people who prepare for a digital remote-work setting because they want to become digital nomads.

The paper of Cook (2023) distinguishes digital nomads from other types of mobile persons. Bozzi (2024), Henkens (2025), and especially Lacárcel (2025) look deeper into the typical work situations and patterns of digital nomads. The analysis of Lacárcel (2025) covers aspects like challenges and opportunities of the digital nomad life-style and also future trends. All three papers emphasize the

relevance of work-life- integration and the need to settle frequently into new environments where digital nomads need to build their context and infrastructure. The digital transformation plays a major role for both the type of work and the work environment. Collaboration and information exchange via digital channels are perceived as the main connection between the digital nomads, their peers, their customers (or employers) and their work. A continuous acquisition of knowledge and competences is another key factor, also done with digital means. All three papers highlight the psychological factors of digital nomadism and the correlation with personality traits. This involves also the view on the challenges and chances, the risks and opportunities, which are described by Hensellek et al. (2021). Overall, the cursory overview of scientific literature provides a quite good idea about the typical personas (as idealized roles) behind the phenomenon of digital nomads.

Competences for Digital Nomads

Competences in the sense of this contribution are holistic and comprehensive descriptions of the knowledge, skills, abilities and attitudes which enable a person to perform successfully in a role or in solving a task. Competences and Competence-based Education (CBE) are important concepts for the development of educational activities in higher education (Holmes et al., 2021). Educational activities aim for a competence gain which is described as learning outcomes. Therefore, the required competences for the learner are the central starting point for instructional and educational design.

With respect to the required competences for digital nomads, three publications were analyzed.

- Already the paper of Tsvetcoff et al. (2025) puts the emphasis on (entrepreneurial) soft skills. Within the mix of technical competence, professional competence and global competence (Rajala, 2012), the digital nomads of course also need technical competence. But this does not differ much from other workers. The focus on so-called “soft skills” shows that the distinguishing differences between educational activities for digital nomads will not be in the field of technical, task-related competence but in the field of professional and global, role-related competence. Still, specific technical competences are needed (e.g., digital literacy with respect to online collaboration). But the specific differentiating technical competences are less work-content related and more work-style related. “Soft Skills” are a very wide concept which is therefore rejected by many scientists (claiming that they are by no means “soft”). Professional competence – describing job-related transversal skills – und global competence – describing international and intercultural skills, abilities and attitudes – are a more precise formulation. In combination with personality traits, motivations and beliefs they form a competence profile which is commonly called “soft skills”. Such competences are difficult to assess and also difficult to train directly, they are sometimes called hidden competences (Mikhridinova & Wolff, 2025) for this reason.

- Another relevant competence for cross-border work is the language. E.g., Tedesco (2025) highlights that English as the lingua franca for digital nomads. But, in addition, there is a relevance of the local language at the different destinations in order to allow digital nomads to settle down to some extent and to build local relations. This is also important in order to overcome isolation and loneliness, since specific psychological challenges apply to digital nomads. For immersion into the local context, transcultural awareness has to go

hand in hand with language socialization. Finally, communities of digital nomads develop their own linguistic (and behavioral) codes.

- Finally, Kulshrestha (2025) provides a comprehensive clustering of competences for digital nomads:
  - Digital nomads benefit from a set of *personal skills and attitudes* which include openness and adaptability, forming a *digital nomad mindset*.
  - The interpersonal skills are very important if digital nomads work in (virtual) teams or projects and if they need to get connected in different contexts. This includes classical soft skills like communication, negotiation, conflict management etc.
  - Another set of skills is labelled as digital nomad "*lifestyle*". This includes skills which support work-life integration and the frequent relocation. It also involves the skills to develop an appropriate work and life environment and infrastructure.
  - A broad range of skills is clustered under the terms of *organizational skills*. This includes strong self-management skills and attitudes like motivation and enthusiasm. Furthermore, personality traits and abilities play a role, e.g., innovativeness, agility and flexibility. Under this class of skills, Kulshrestha (2025) summarizes skills which this paper would put into separate clusters:
  - The *international competences*, especially language skills and knowledge about international legal aspects and business routines. Furthermore, the *intercultural skills* are part of this cluster, including the ability to adapt to different cultures.
  - *Digital literacy* and the ability to establish an appropriate digital infrastructure for work, for life, for learning, and for communication in work and private life.
  - *Personal integrity and stability* which are part of the personality.

Not explicitly listed but required according to the literature for freelances and digital entrepreneurs are commercial skills, especially (self-)marketing, sales, accounting and financial management.

Learning Settings and Didactic Patterns

To derive the learning outcomes of educational activities from the required competences for digital nomads, the appropriate learning settings and didactic patterns need to be identified and developed. The approach of the authors is to combine a preparation of learners with knowledge (e.g., teaching, online course, reading materials) with the assignment of a practical task which is conducted as a project with a range of work situations. Then, the experience from the practical tasks is reflected and discussed by the learners in the light of the (theoretical) knowledge. This didactic approach is not new and was used, evaluated, and described by the authors before (Mikhridinova, Joseph Ngereja, et al., 2022; Mikhridinova, Ngereja, et al., 2022; Wolff et al., 2022). For the specific learning outcomes for competences for digital nomads, the assignment should simulate work situations of digital nomads which are are characterised by the following elements:

- The *task* (or tasks) of the practical assignment should have sufficient complexity based on real (or realistic) case studies. To simulate the work of freelancers, it should contain both individual and team elements. *Novelty*, complexity and time pressure should stimulate stress which can be amplified by *uncertainty, ambiguity, and change*. The tasks should require independence, e.g., judgement and decision making, furthermore self-

management. These aspects are task-related, or work-content related and depend on appropriate case studies.

- The learning situations should require *virtual* collaboration. This develops digital literacy and respective communication and organization skills. The quality of the learning experience depends on the availability of a *professional digital infrastructure*.

- The collaboration should happen cross-border, e.g., the learner should participate in a virtual cross- border project (Wolff et al., 2022). Especially in project settings, the learners can take different roles which help to develop role-specific competences, e.g., interpersonal and professional skills.

- So far, the requirements for the learning settings are similar to the ones in PjBL or COIL. More specific scenarios (for digital nomads) may require *relocation and settling in*. This can be achieved by moving learners physically to another place (best case: another country) while they conduct their tasks, covering *self-management and organizational aspects* while being *under typical stress situations* for digital nomads.

- For the *intercultural and international aspects*, the learning setting should involve locations in and learners (as project team members, but also in other roles) from *different countries*. The effect is amplified if learners come from (very) *different cultures and different time zones*.

- Many digital nomads (especially digital entrepreneurs) work in *innovation*. Hence, the assignment may be an innovation project, the best case an *interdisciplinary* one with *high uncertainty and novelty*. This can create a motivating and intense learning situation, bringing learners into a "flow". Such a "flow" is considered to keep digital nomads motivated, to foster self-discipline and to perform under pressure. Innovative tasks stimulate *learning* and train the *absorptive capacity* of learners. Apart from problem-based learning, also competitive elements (e.g., challenge-based learning, games) can stimulate such "flow" and let learners experience success if they perform well.

The conference topic of stimulating "Innovation and Openness" in learning is addressed by these aspects due to its focus on digital transformation, innovation and entrepreneurship.

IMPLEMENTATION AND EVALUATION IN EUROPIM – CASE STUDY

EuroPIM Virtual Master School

The design of the didactic formats and educational activities is tested and evaluated within the Virtual Master School of the "European Partnership for Project and Innovation Management (EuroPIM)" (Fachhochschule Dortmund, 2025a), an association of 5 European universities with Master's and postgraduate programmes in project management, IT, engineering, and innovation & entrepreneurship. Typical work situation of graduates are virtual cross-border projects, including work as digital nomads, e.g., freelancers. Such work situations are simulated with PjBL activities as part of the learning trajectories in order to develop transversal skills, e.g., communication and management

skills, IT literacy, team skills, and English language proficiency. The authors used this setup for evaluation before (Mikhridinova, Joseph Ngereja, et al., 2022; Mikhridinova, Ngereja, et al., 2022; Wolff et al., 2022).

Another asset of the authors' consortium is a Digital Education Ecosystem (DEE) (Wolff et al., 2021) which allows cross-university and cross-border cooperation in education, project execution and the joint development of educational resources. For the educational experiments conducted in this contribution the DEE serves as the digital learning and project space for digital nomads (Nithitaknakin et al., 2023). It also includes professional project management and collaboration tools, e.g., for agile project management, for software development and for digital media development.

The EuroPIM Master programmes are interconnected with several educational activities (see Fig. 1). First, curricula are aligned to allow an easy integration of elements (and credits) between the programmes. Educational modules contain diverse educational elements (e.g., courses, assignments, projects) which can be used to create cross-border learning experiences, e.g., by exchanging students and lecturers, but also by conducting the element with students from different programmes participating online or onsite. Joint onsite elements like summer schools (or spring or winter schools) contain intensive block weeks in presence at the partner universities (e.g., implemented as Erasmus+ Blended Intensive Programmes (BIP)). A joint learning management system (LMS, moodle) and a joint identity management system (IDM) for cross-university IT access allow teaching and learning from anywhere by anyone at any time. Learners and teachers can become digital nomads.

The blend of online cross-border elements and local onsite elements (e.g., activities of local sub teams) offer chances for the inclusion of students and teachers who cannot participate in physical mobility, e.g., by including Ukrainian partners in the past years (EuroPIM has 3 Ukrainian partner universities, with joint modules and double degrees) or during the COVID pandemic. Teachers can work from where they are (e.g., refugees or at home), the same as learners. Such situations show that we live in times with both voluntary and involuntary mobility (Tedesco, 2025). The advantages of a virtual cross-border Master School are relevant to the aspect of "Accessibility and Resilience" of the conference programme.

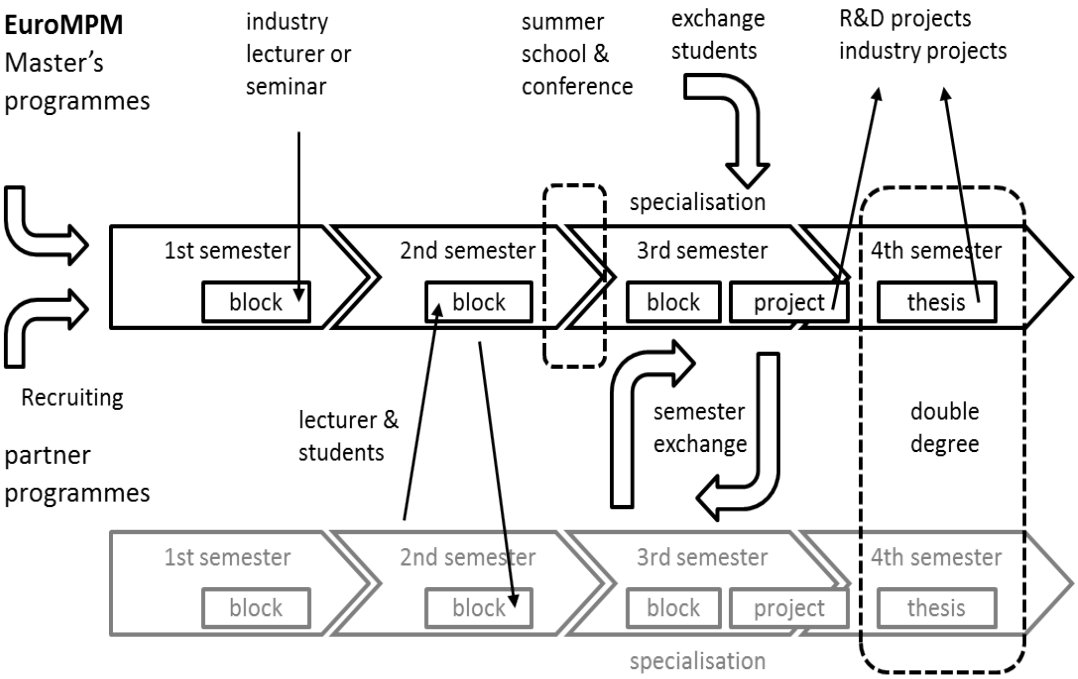


Figure 1. Exchange concept between programmes of EuroPIM Master School (Wolff et al., 2021)

Virtual Cross-Border Projects

One of the very successful didactic formats of the EuroPIM consortium (Wolff et al., 2022) are virtual cross-border projects which are conducted for various project types (short time, whole semester, research and innovation projects, management projects). In such projects, student teams with participants from several partner universities are formed, usually with an interdisciplinary mix, e.g., covering the roles of entrepreneur, innovator, project manager, programmers etc. The projects are mainly conducted in online collaboration while there can be elements in presence (e.g., a kickoff and closing event at one university, a block week) and local sub-teams can work in presence, e.g., building a prototype in a lab. Company visits and involvement of company experts (e.g., as jury, or as "simulated" customer or project sponsor) make the experience more realistic. Documentation, online courses, tool tutorials, teaching, reading materials etc. support the acquisition of knowledge. Project reviews and result presentations are used for assessment. The projects are developed with concepts from instructional design and (digital) learning design (Kim & Lee, 2021). They follow the CBE approach (Holmes et al., 2021) where the desired competence gain is achieved by learning outcomes which are created in learning settings. These learning settings are the work and project situations which happen in the virtual cross-border projects (intentionally, or even accidentally). Realistic work and project situations by combining the right project type with the right company case (see Fig. 2). Such a simulated real-world project provides tasks and (team) roles which create the intended work and project situations. The experience of such situations in a certain role and working on a certain task in combination with a reflection in the light of theoretical knowledge delivers a competence gain to the learner. This can be partly managed by choosing the right project and case and by giving the learner the right role and task. "Right" in this sense may also be "wrong" in reality since a learner might learn more from taking a role where they lack a competence and maybe even from failing in that role. Personality tests are used for reflection, too. A sequence of specifically designed projects and cases in combination with variation of the assigned roles and tasks delivers competence gains and implements

a learning trajectory and a competence development path (red in Fig. 2). IT tools provide digital learning space for the digital nomad (Nithitaknakin et al., 2023), using the DEE (Wolff et al., 2021). Developing (digital) case studies and tailoring them to the needs is described by Wolff et al. (2025). Digital case studies provide all materials online (e.g., including films, interviews) for cross-border usage. Apart from collaboration and communication, the virtual cross-border projects contribute to language learning and intercultural training (Wolff et al., 2021), though the experience in EuroPIM shows that most learners don't perceive the English language communication as challenging. Using a project management framework (in the case of Wolff et al. (2021) the agile framework Scrum) was perceived useful for getting up to speed fast with a team which does not know each other previously and didn't meet personally, meaning, the project management method Scrum served as a lingua franca in this case.

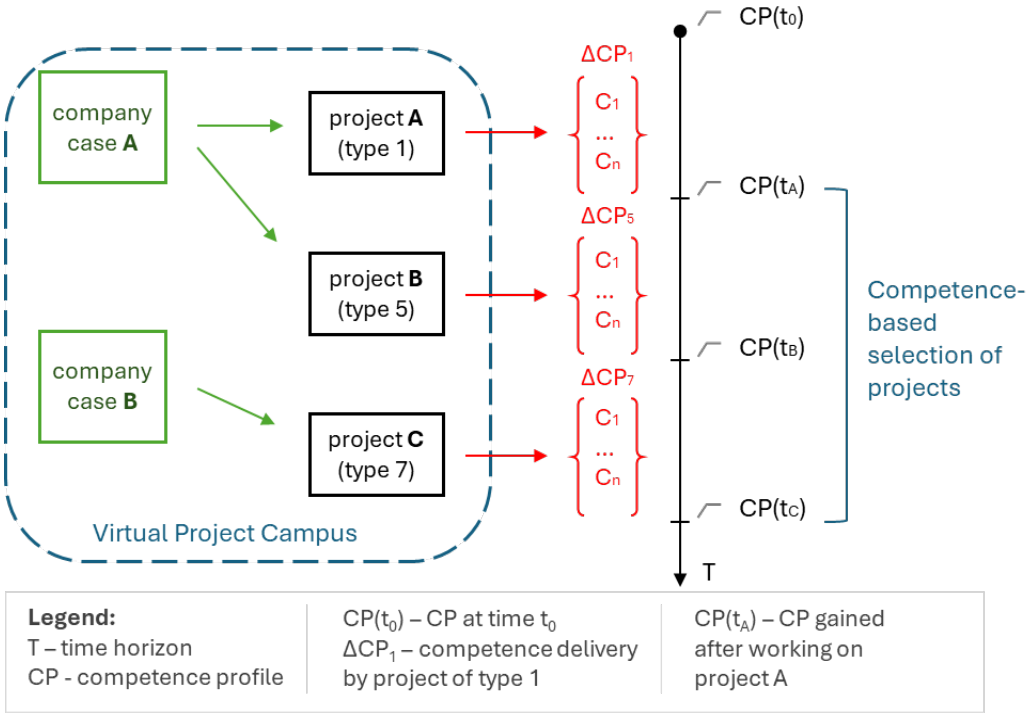


Figure 2. Competence development by combining projects and cases (Mikhridinova, Ngereja, et al., 2022)

Development and Test Within the Nomadtrail Project

The development and test of the new didactic approaches for competences for digital nomads are conducted within the Erasmus+ Cooperation Partnership "Virtual Projects for European Digital Natives (NomadTrail)" (Fachhochschule Dortmund, 2025b) where all 5 partner universities of EuroPIM are working on educational materials and didactic approaches for PjBL, especially for innovation projects in engineering, IT and business which are conducted by internationally and interdisciplinary mixed student teams in virtual cross-border projects. The EuroPIM partners have already developed a portfolio of education formats, didactic concepts and learning materials within the Erasmus+ Knowledge Alliance "Projects for the Digital Transformation (ProDiT)" where NomadTrail is building on. The formats and materials were evaluated within the EuroPIM Virtual Master School. During the past 2 semesters, 2 new learning trajectories with a sequence of educational formats and activities were

developed which pay specific attention to competences and learning outcomes for digital nomads. These formats have been:

1. *A short-term virtual cross-border project* (3 credits, ECTS) where teams of 6-10 students from 3 Master's programmes and 2 countries (Germany, Spain) got the assignment to develop a sustainability assessment app. The students didn't meet before. The Spanish students were part- time students who work full-time in their "normal" job during weekdays, while the German students were full-time students. The teams used the DEE and a set of online project management tools (Atlassian Jira and Confluence, Git) and a no-code-platform (Figma) for the app development. A moodle course collected all materials. Company cases were provided where sustainability had to be assessed with the app. Students got instructed in briefing sessions and received training in app development with Scrum. Both the German and the Spanish sub-groups also met onsite at their home university. Students conducted personality tests (Belbin project roles) and aligned by themselves in the teams on the assignment of roles to people. Progress was reported in the sprint reviews and sprint retrospectives which were conducted on Friday evening or Saturday. Keeping up with the (daily) standup calls was particularly challenging for the Spanish students. This learning setup included almost all aspects of working situations for digital nomads apart from the relocation and settling in aspect (see section on learning settings and didactic patterns). For the upcoming winter term, this format is planned to be extended with a short physical mobility from Germany to Spain and 2 weeks later vice versa within an Erasmus+ BIP in order to simulate the relocation and settling in aspect. This educational element is finished and got evaluated in the next section.

2. *A long-term virtual cross-border project* (6-8 credits, ECTS) where teams of 4-6 students from 6 Master's programmes and 3-4 countries (Belgium, Germany, Spain, Ukraine) got the assignment to develop a board game for education on sustainability, based on real cases from food industry. The setup had similarities to the short-term project, but some aspects were added. It involved a 1-week intensive block week in Belgium in the early stage where all students (apart from the Belgium ones) had to relocate. Furthermore, the development involved physical assets (the board game) which had to be produced in labs and workshops, a fully online execution was therefore not possible. This element is still ongoing; the first evaluation results will be available soon.

NomadTrail (and all other activities of the EuroPIM consortium) employ a quality management (QM) system which is coordinated by an Internal Evaluation Board (IEB). The development and test of elements is done incrementally in several iterations, starting with a specification (including learners' need analysis, competence and learning outcomes, didactics, content, possible learning activity plans etc.) which is reviewed by experts and released by the IEB. Then, learning materials and activities are implemented in pilot teaching and evaluated. This is described for the short-term virtual cross-border project in the next section. Results are again reviewed, and improvements are planned. Very good results are released as Open Educational Resources (OER). The internal quality management with the IEB addresses "Context and Quality" conference topic as another secondary aspect.

Evaluation Results

The *short-term virtual cross-border project* evaluated in this section took place from September 2024 to January 2025, with a 6-week practical project phase from November-Dezember 2024. A similar pilot run was already done in the winter term 2023/2024, but in that case only with German students, and got evaluated and the results were published, too (Wolff et al., 2022). In winter term 2024/2025 the project was attended by 43 participants, where 36 came from Germany (Fachhochschule Dortmund, 16 students from the European Master in Project Management (EuroMPM), and 20 from the Master Digital Transformation, a software engineering programme). Another 7 students came from the EuroMPM programme of the University of the Basque Country (UPV/EHU) in Bilbao, Spain. For the assignment of developing a sustainability assessment app, 8 student teams were set up, 3 with Spanish students, all with a mix of project management and software engineering students. Roles in the project (e.g. Product Owner, Scrum Master, Developer, Tester) were assigned by the team based on the Belbin test results.

For the evaluation, a comprehensive survey was conducted after the final sprint retrospective in January 2025, where 26 participants answered the survey, 21 from Germany, and 5 from Spain.

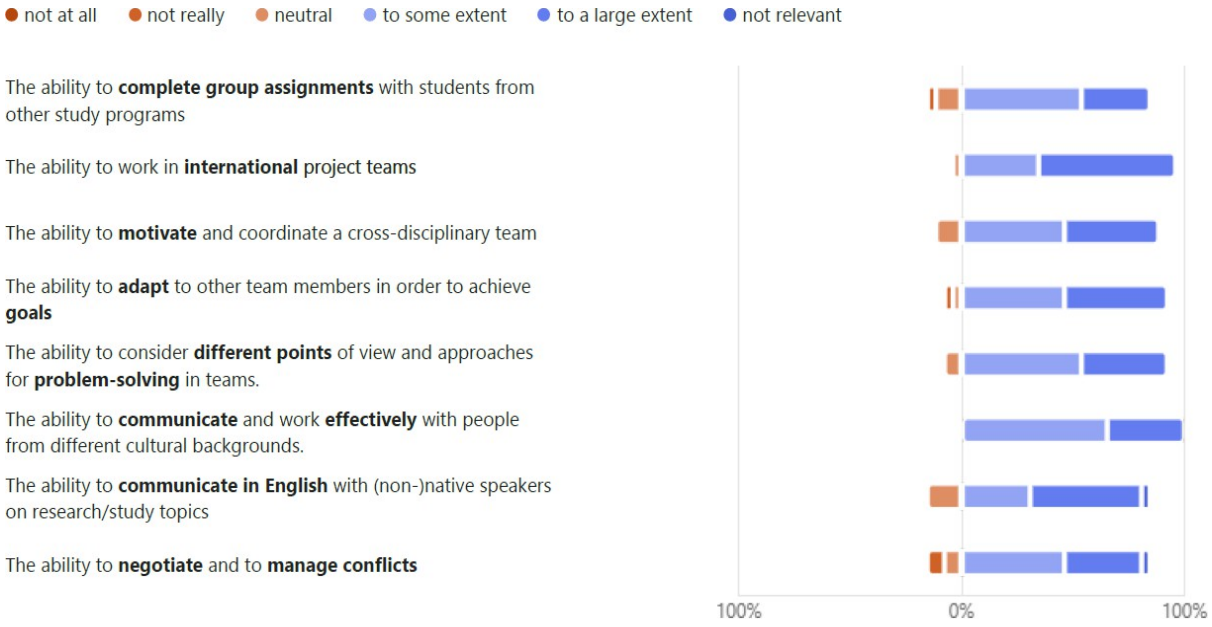


Figure 3. Feedback on abilities and competences developed by the participants of the pilot run
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The first set of questions (see Fig. 3) puts the focus on the abilities and competences which learners developed by taking part in the course, including the virtual cross-border project. Questions were aligned with the required competences for digital nomads from Kulshrestha (2025) as described in the section on “competences for digital nomads” in this paper. The respondents largely confirmed that the project helped them to develop their competences. This is a self-perception directly after concluding the project and cannot serve as a full validation of the quality of the didactic format. It’s more like a first impression and involves only directly affected learners, leading to certain bias. In addition, it can be mentioned that the performance of the students was also assessed as very good or good by the examiners. For that grading, the competences mentioned in Fig. 3 are only a part of the overall

assessment. Nevertheless, from both results it can be confirmed at a first conclusion that the new format is promising.

Another set of questions (see Fig. 4) puts the focus on the assessment of the effectiveness of the didactic format of the virtual cross-border project in the context of the educational programme. This is of course more difficult to assess by the learners. Again, the answers show that learners are very positive about the learning experience. As a small observation, only the question about the usefulness of improving the IT skills got some negative feedback (which is partly explainable since 20 students came from IT programmes) and the idea that the learning experience might heavily depend on the other team members found some objections. The evaluated aspects are again taken from the characteristics of work situations of digital nomads as described in the section on "competences for digital nomads". In addition to the survey, the specification document of the educational format contains information about the assumptions behind Fig. 4. This specification was reviewed by 2-3 experts (assigned by the IEB) and they confirmed that the format is useful for achieving the intended learning outcomes and that the learning situations resemble typical work situations of digital nomads.

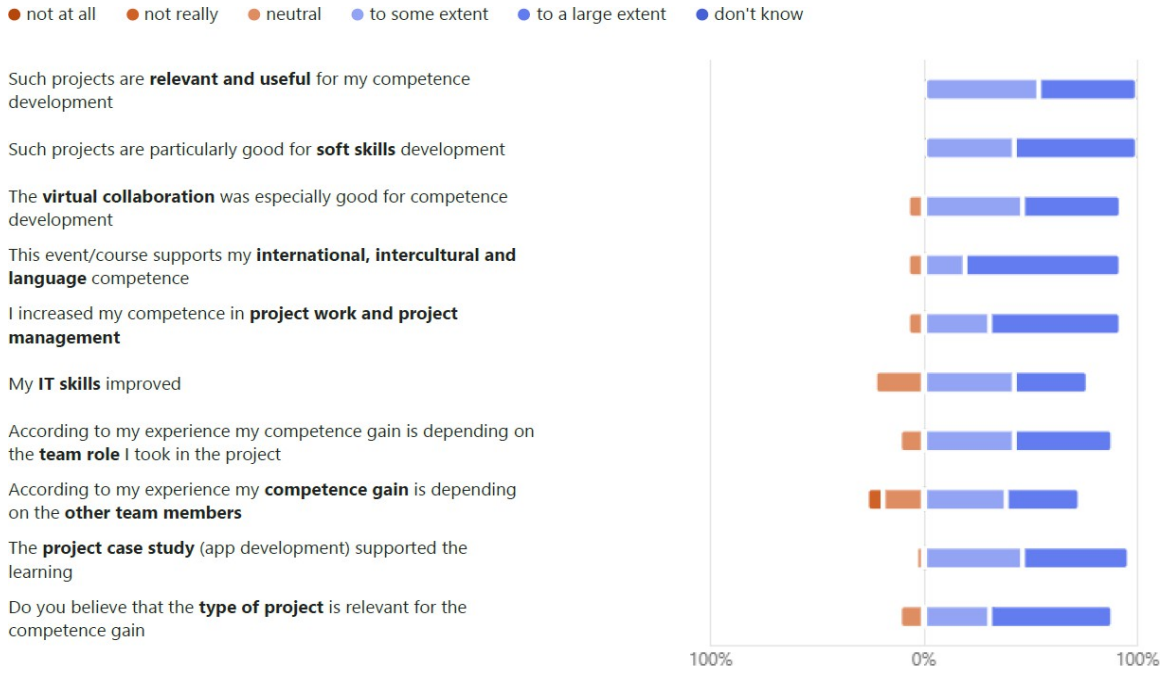


Figure 4. Experiences and opinions about using virtual cross-border projects as an educational format
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The pilot run and the evaluation results deliver some answers to RQ3 and support the hypothesis H_1.

Outlook on Further Development, Test and Evaluation

As mentioned, the next results are expected by the end of the summer term 2025 from the pilot run of the long-term virtual cross-border projects. Furthermore, the didactic format of the short-term virtual cross-border project is currently in the improvement loop and will be repeated in the winter term 2025/2026, again with Spain and Germany, but now with a physical mobility included. NomadTrail works on digital case studies and plans to include another reflective element where student teams put their experience into the context of the published scientific literature.

The authors are planning more targeted evaluations with a mix of surveys and interviews since students struggle to judge if the learning experience correlates to the situation of digital nomads, even though the Master's programmes have many international students which relocated to Germany and Spain for example, and the fact that many of the Ukrainian students are involuntarily mobile, as refugees. Hence, interviews with and feedback of digital nomads are planned to be considered, specifically for the improvement of digital case studies.

DISCUSSION AND CONCLUSION

Work Situations as Didactic Patterns in Higher Education

The research and the experiments presented in the preceding sections demonstrate how the analysis of typical work situations and the required competences of a specific type of worker can be used to derive learning experiences which can train the competences in higher education. The training is becoming more authentic, motivating and effective, if the learning situations are typical work situations or at least similar to them. This finding is not new and the basis of many scientifically investigated didactic formats, as mentioned for example PjBL and COIL. The success of such elements in the educational programmes in higher education is growing. What is new – at least to the best knowledge of the authors– is the consideration of the emerging phenomenon of the digital nomad. What is also new – and even more important according to the authors' opinion – is the systematic and structured process described in this paper. From the analysis of the new form of work, the typical work situations, and the personas of the workers a set of distinguishing characteristics of the work situations and a set of required competences for the workers is derived. Based on this, learning outcomes are defined, and an educational format is developed – or in this case, adapted from the existing formats of PjBL and COIL. Furthermore, the incremental improvement and quality management might be interesting for readers.

Tailored Learning Situations for Individualized Learning Trajectories

For the future development of higher education, the trend goes towards individualized learning trajectories which are tailored to the prior competences and to the learning habits of learners. As shown in Fig. 2, the project-based approach presented in this paper can be used to develop a tailored competence development path for a specific learner by selecting the right projects and cases and by putting the learner on the right roles and tasks. This is not only true for projects (as didactic formats) but for any learning situation and – consequently – for any work situation which is used as a didactic format or pattern. In that sense, work situations are turned into didactic patterns. If in future higher education institutions an individualized and effective competence management will be established, this can be used to tailor learning situations and a specific sequence of learning situations each learner's needs.

Conclusion and Outlook

The paper presents the analysis of the work patterns, personas and competence requirements of the emerging worker type of digital nomads based on a cursory review of recent scientific literature. This analysis leads to a quite good understanding of the educational needs of learners which might one day live and work as digital nomads. From this analysis, it became clear that some students already live and learn to some extent as digital nomads and that didactic formats like PjBL and COIL already create learning situations which are similar to work situations of digital nomads. This is specifically true for

the virtual cross-border projects which have been conducted for some years by the EuroPIM consortium.

Then, the paper presented the efforts of the NomadTrail project to develop specific didactic patterns and educational formats which adapt the virtual cross-border projects to become more useful in delivering the competences for future digital nomads. Two formats (short and long virtual cross-border project) are presented and for one of them (short) first evaluation results of a pilot run as an educational experiment are presented. The evaluation results and the QM results of the IEB are quite promising.

The current research supports the hypothesis H_1 that digital nomadism is a source of useful didactic patterns and approaches, creating effective learning situations which deliver competences to learners which are valuable for future work-life settings, especially for the work-life integration of digital nomads. This is not a validation of the hypothesis yet, but more a first confirmation. As part of that confirmation, the paper delivered some answers to the 3 research questions (RQ) as mentioned in the respective sections. Specifically, for RQ1 the literature analysis delivered a good understanding of typical and maybe unique work situations of digital nomads. Three papers were found on the specific competences needed for a successful life as a digital nomad. The educational experiment within the NomadTrail project contributes to RQ2 with some learning situations which helps to acquire such competences and some comparison with learning situations in PjBL and COIL. Finally, contributing to RQ3 the experiment applied the learning situations in pilot runs in several international Master programmes. The research on NomadTrail is a work in progress and more results are expected. Furthermore, the worker type of digital nomad is just one example of new work and there is a need to analyze more worker types and work situations to make educational programmes effective also in future.

AUTHOR NOTES

No generative AI like GPT-4 was used for writing or assisting in the creation of this scholarly paper.

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Data Accessibility Statement

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Ethics and Consent

Consent was received from the participants of the survey where results are part of this paper.

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A Scalable, Cost-Effective Hybrid AIG Workflow for Engineering Item Banks

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ABSTRACT

Generation (AIG) offers a more efficient alternative, with three primary approaches: template-based, non-template-based, and hybrid AIG. However, existing work often shifts rather than reduces cost (e.g., custom software or commercial platforms), focuses narrowly on Multiple-choice questions (MCQs), and provides no systematic exposure control. We designed and piloted a hybrid AIG solution for an Open Polytechnic engineering course. Six key steps— (1) defining the assessment construct and content structure, (2) creating and refining a sample test paper, (3) developing item models, (4) generating multiple items via Excel macros, (5) mapping item distribution to control exposure, and (6) deploying test papers—were automated or semi-automated with AI support. This process produced 100 test versions with <20 % item replication and reusable models for on-demand expansions. Projected cost savings and maintained validity suggest strong potential for small-to-medium-scale item banks. Future work will integrate the OpenAI API and extend to constructed-response items.

Keywords

Automated item generation; hybrid AIG; assessment item bank; engineering education; excel macros; AI-augmented design; test assembly; item modelling; exposure control; cost effectiveness

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INTRODUCTION

The Open Polytechnic of New Zealand Ltd (OPNZ), a government-owned tertiary institution, is the nation's leading distance and online learning provider. It delivers certificates, diplomas, and degrees to around 30,000 learners spread throughout New Zealand each year. The organisation develops its own courses, including assessments, for both internal use and external partners.

Assessment development for the wide range of qualifications that the institution offers is time-consuming and incurs significant costs. For large-scale courses delivered through open and flexible methods, it is critical to ensure robust and effective assessment development processes because of the impact on a high number of learners. This is especially important because assessments that lack validity and reliability not only negatively impacts learners, but also the academic reputation of an organisation, potentially undermining the value of its qualifications.

The organisation has worked to reduce assessment development costs while maintaining quality. This has included a range of approaches focusing on enduring design elements, which include authentic tasks that are realistic to the working environment, tasks that are situated in a learner's context, interactive oral components and randomisation of information, data or questions provided to individuals. The randomisation approach aligns with item banking and has been done on a small scale to date. Item banking involves creating and maintaining a set of items to construct multiple versions of assessments or tests. Traditionally, these item banks were developed through a highly manual process, with each item individually authored by a subject matter expert (SME). The item banks followed a structured format in Excel that could be imported or built directly into OPNZ's own Learning Management System (LMS), iQualify. However, the development of traditional large item banks was not pursued due to the high development costs and reliance on third-party products. This placed the organisation in a challenging position: it needed to generate a large number of test papers but not at a scale that would justify investing in customised software.

The initial interest in developing an assessment item bank for engineering tests and exams at OPNZ was sparked by the winding down of VEENZ (Vocational Engineering Education NZ) in 2022. This presented an opportunity to develop a resource for OPNZ and other providers of engineering studies. However, this initiative stalled when it became clear that VEENZ would continue its operations. Therefore, OPNZ shifted its focus to the rapid advancement of AI technology, which since 2023 has introduced challenges to assessment design but also created opportunities for innovation and cost reduction. This led to a renewed interest by OPNZ in exploring innovative item bank solutions.

While the primary objective of developing assessment item banks is to address the substantial costs associated with reproducing engineering tests and exams, a review of the previous processes highlighted several underlying challenges. First, the item bank process involved long development cycles. Second, reusing questions in existing engineering papers was challenging due to inconsistencies in assessment constructs and difficulty levels. Third, there were misalignment issues caused by inconsistent interpretations of learning outcomes and externally contracted SMEs having limited familiarity with course content.

Considering these challenges, the goal of the DE4101 Engineering Fundamentals item bank pilot project, as presented in this article, is to create a scalable and cost-effective approach for developing a small- to medium-sized item bank and generate test papers with AI support.

LITERATURE REVIEW

Assessment item banks are centralised repositories of test questions and related metadata which offer significant potential for enhancing the quality, consistency, and efficiency of assessment in higher education. However, leveraging item banks for test paper generation presents a number of substantial challenges. This literature review explores these challenges and examines the emerging potential of automation and AI-based tools to address them, while also identifying the systemic barriers that continue to limit widespread adoption of item banking practices.

High Development Cost of Item Generation

The traditional approach to item generation is both resource-intensive and costly. Each item must be meticulously written, reviewed, validated, and tagged, which is a labour-intensive process that demands significant input from SMEs and assessment professionals. According to a 2022 report by the National Academies of Sciences, Engineering, and Medicine (2022), the cost of creating, reviewing, and pilot testing an item can range from several hundred dollars for selected-response or short constructed-response items to nearly USD$3,000 per item. Draaijer (2019) translated this into an estimated 10 to 20 working hours per item, assuming an average cost of about USD$120 per hour.

In the context of higher education, where fully scaled IRT (Item Response Theory)-based item banks are often not required or feasible due to infrastructure or other constraints, the development cost should be lower. Hartog et al. (2008) analysed task allocation in the design and development of digital closed questions across fifteen small to mid-sized item bank projects at four universities. They estimated that developing a single digital closed item typically requires between 1.9 and 2.1 hours of work. As is widely acknowledged in the field, the cost and workload increase significantly when developing items aimed at assessing higher order thinking skills, compared to those targeting factual recall or basic knowledge (Draaijer, 2019). It is reasonable to assume that the average per-item development time, particularly for more complex or cognitively demanding questions used in summative assessments, could range from about 2 to 4 hours.

Automated Item Generation (AIG) is a technology-driven approach to producing large volumes of assessment items rapidly and cost-effectively, which has emerged as a potential solution. AIG's approaches fall into the following two categories: template-based and non-template-based. The template-based AIG approach utilises predefined templates or item models crafted by SMEs. Each template/model outlines a specific item structure, including variables and parameters that can be systematically manipulated to produce multiple item variants. However, this approach is far from a turnkey solution since its implementation requires significant upfront investment in cognitive and item model development, generation software, and quality assurance processes (Gierl and Lai, 2016). Draaijer (2019) points out that the application of AIG in higher education is limited, apart from the domain of medicine. Kosh et al. (2019) conducted a cost-benefit analysis of template-based AIG for K–12 mathematics, concluding that AIG only becomes more economical than manual item writing when more than 173–247 items are generated in a narrowly defined domain. This scale of output, as well as the infrastructure to support it remain out of reach for many small and medium-sized institutions.

Recent developments in large language models (LLMs) have introduced a non-template approach to AIG, capable of generating items directly from prompts or data, without relying on predefined templates. This approach aims to minimise human involvement, allowing algorithms to create diverse

items by analysing existing content to identify patterns. A review of 60 studies on LLM-based AIG found these tools to be effective and flexible, with few constraints on subject matter or format. However, quality concerns persist as many AI-generated items suffer from misalignment with learning outcomes, lack of construct clarity, and poor pedagogical design (Tan et al., 2025).

To address the gap between these two approaches, Shin (2021) and Kıyak and Kononowicz (2025) have proposed two different hybrid AIG approaches. Shin (2021)'s approach uses AI to automate repetitive tasks like text preprocessing, topic modelling and item generation. Humans guide the process by designing cognitive frameworks, developing item templates, validating generated items, and addressing biases or misalignments. Kıyak and Kononowicz (2025) suggested a 7-step model that moved one step further in terms of leveraging AI's capabilities in the development process. It is used to automate the labour-intensive tasks of creating templates and cognitive models by identifying variable elements from a parent item and identifying replacements based on predefined rules. Human experts guide the process by validating AI outputs, refining templates, and ensuring alignment with learning outcomes and domain-specific requirements. Their role is transformed from a creator into a reviewer and AI takes over most of the cognitive workload.

Kıyak and Kononowicz (2025) demonstrate that a hybrid AIG, which relies on AI for most of the cognitive work in the development process, is possible. However, their research is still in the proof-of-concept stage and is limited to developing MCQs (multiple-choice questions) in the medical education field. Further empirical studies across various fields and item types are needed to validate the efficiency of this method.

Both these hybrid approaches could still involve high development costs. Shin's (2021) approach needs extensive human input in designing cognitive frameworks, developing and validating item templates, and addressing bias. Integrating advanced Natural Language Processing (NLP) tools and maintaining the technical infrastructure require specialised expertise and resources, making the overall process resource-intensive despite automation. A non-AI software is still needed to generate items from the approved item templates in Kıyak and Kononowicz's (2025) model, which requires significant investment in money and effort and might not be practical for small and medium-sized item bank development.

Segmented Workflow

Developing test papers using an item bank typically involves four key stages: item generation, test assembly, test deployment, and post-assessment analysis. However, these stages are often highly segmented, with each occurring in separate systems or environments that lack integration and requiring manual transfers in between (Chituc et al., 2019; Gierl et al., 2019).

High-end professional assessment platforms offer end-to-end item generation and test assembly workflow. However, the price is out of the reach for small or medium-sized institutions. Chituc et al. (2019) identified that there is a gap between the current LMSs functions and the need for more advanced requirements such as versioning and quality control. The mainstream LMSs such as Moodle, Canvas, and Blackboard offer basic item banking features, including question storage, categorisation, randomisation, and delivery. However, key functions, such as item modelling, template-based generation, peer review, metadata tagging, blueprint alignment, and automated test assembly are often missing or poorly supported. As a result, institutions frequently rely on a fragmented combination of tools to author, review, assemble, and deploy assessments.

This segmentation creates operational inefficiencies and introduces avoidable risks. For example, when item generation and test assembly take place in different environments, items must be exported, reformatted (e.g., into QTI, XML, or CSV formats), and imported into new platforms, where they must be revalidated for compatibility. These handoffs often require manual workarounds or developer input, increasing the likelihood of delays and errors, particularly in institutions with limited technical capacity. Moreover, many small and medium-sized institutions still rely on paper-based delivery for summative assessments, which further limits their ability to benefit from a fully integrated item banking and test development process.

Pedagogical Challenges

Item banks can provide flexible and easy-to-implement solutions for formative and summative assessment once developed (Beerepoot, 2023). However, using an item bank to develop high-stakes summative assessments introduces several pedagogical and procedural requirements.

Item formats must support a broader range of assessment methods. AIG studies have reported that MCQs are the most frequently generated item type (Circi et al., 2023; Tan et al., 2025). Although research has demonstrated that well-constructed MCQs are capable of assessing higher-order cognitive skills, such as apply, analyse and evaluate levels of Bloom's taxonomy (Haataja et al., 2023; Liu et al., 2023; Palmer & Devitt, 2007; Scully, 2017), more diverse assessment forms are needed, especially in summative assessment to ensure a comprehensive evaluation of the learning outcomes.

All items used in high-stakes contexts must undergo formal moderation and approval. The quality of automatically generated items raises considerable concerns (Pugh et al., 2016). Although a few studies provide evidence that the AIG approach can produce high-quality items with a consistent difficulty level (Falcão et al., 2023; Sayın et al, 2023), these studies are limited to MCQs. Tan et al. (2025) highlight the need for a systematic quality assurance process in the AIG development pipeline to ensure item reliability, validity, and fairness. However, implementing such a process requires substantial effort and specialised expertise. This includes technical capabilities for integrating and managing AIG tools, psychometric analysis skills for validating item characteristics through methods such as IRT, and subject matter expertise for reviewing and moderating generated content for accuracy, alignment with curriculum, and potential bias. Additionally, institutions must establish structured workflows for item review, tagging, and approval. They must also maintain metadata and audit trails for quality monitoring. These requirements pose a significant challenge for small and medium-sized institutions, which often operate with limited staffing, infrastructure, and access to psychometric analysis skills.

While assessment item banks offer significant benefits for improving assessment practice, their development and implementation in small and medium-sized institutions face persistent financial, technological, and pedagogical barriers. Manual item creation remains unsustainable at scale while AIG and LLM-based approaches show promise but require significant investment and expertise. Existing LMS platforms fall short of supporting end-to-end assessment workflows, and the need for diverse item formats and rigorous quality assurance must be carefully addressed.

Addressing these challenges will require an integrated approach, which combines technological innovation with sustainable workflows, institutional support, and a commitment to pedagogical integrity. Only then can item banks move beyond formative support tools to become foundational components of robust, scalable assessment ecosystems. This paper focuses on the OPNZ's research approach intended to address these challenges.

METHOD AND RESULTS

Two tests were selected from a New Zealand Diploma in Engineering Level 4 course, both of which primarily consist of numerical, calculation-based constructed-response questions.

The template-based AIG approach was adopted to develop this bank and implemented through a hybrid workflow. The process starts with developing the test blueprint that serves as a planning framework to ensure that the item bank provides a balanced and representative set of questions aligned with the course's learning outcomes and curriculum standards. A limited number of item models were created by SMEs, from which an automated workflow for item generation, test assembly, and deployment was developed, supported by AI-generated Microsoft Excel and Word macros. This approach was shaped by three key considerations:

- Ensuring the validity of the generated assessments by maintaining alignment with learning outcomes and test blueprints.
- Optimising cost-effectiveness by reducing manual item writing through the use of item models and automation tools.
- Balancing and maintaining item diversity and integrity to control the costs and reduce the potential misconduct risk.

Together, these considerations guided the development of a scalable and sustainable item banking workflow suited to the constraints and requirements of vocational-level engineering education. To operationalise this process, a six-step method was developed and organised into four distinct development stages. Table 1 presents an overview of each step, including its goal and expected output. All development steps were implemented within a Microsoft Excel or Word environment, allowing for transparent tracking, item mapping, and macro-based automation.

Table 1: Six-step approach to item bank development.

Stage	Goal	Steps	Output
Pre-banking	Build up a strong alignment with the learning outcome and course content Develop a calibrated benchmark item model to guide item model development	(1) Defining the assessment construct and content structure	Test blueprint
		(2) Creating and refining a sample test paper	Finalised sample paper and item models to be used as benchmarks
Banking	Develop item models Generate items	(3) Developing item models	Item model bank
		(4) Generating multiple items via Excel macros	Item database
Test item mapping	Map out item distribution into tests	(5) Mapping distribution to control exposure	Test forms
Deployment	Transform the test form in Word documents for deployment	(6) Deploying test papers	Test papers

Step 1: Defining The Assessment Construct And Content Structure

Step one consisted of defining the assessment construct and content structure, then creating a test blueprint. The summative assessment plan for the pilot course included five components: two assessments, two tests, and a final exam. Although the item bank was developed specifically for the two tests, the first step was to create a comprehensive assessment matrix. This matrix mapped each assessment component against the intended learning outcomes, assessed skill areas, and allocated weightings. Its purpose was to ensure balanced and comprehensive coverage across all components of the course. Based on this matrix, a blueprint was defined for each test. The blueprint outlined the skill areas to be assessed, the weighting allocated to each, and the number of item models required to construct each question type. This ensured alignment between the test design and the overall assessment strategy.

Step 2: Creating And Refining A Sample Test Paper

Following the test blueprints, a sample paper for each test was developed. These sample papers underwent internal review and external moderation and were subsequently trialled with a student cohort. The test results were analysed, and the questions in these sample papers were revised accordingly. The finalised sample papers served as benchmarks, with each question representing the intended format, scope, and target difficulty level for its respective test, forming the basis for developing consistent item models in the next stage.

Step 3: Developing Item Models

Using the sample papers as a benchmark, the SME created additional item models that align with the design, format, and difficulty level of the benchmark questions. To ensure quality and consistency, each item model underwent a two-stage review process. A content reviewer verified the subject accuracy and pedagogical alignment, while an editor reviewed the clarity, structure, and language used. This step aimed to establish a high-quality, reusable bank of assessment items that reflected the desired cognitive levels and coverage specified in the blueprint.

Step 4: Generating Multiple Items Via Excel Macros

Items are generated using predefined item models. In the item bank, the variables and parameters within each item model that could be manipulated to produce different items were identified. An example is illustrated in Figure 1, which shows three variables, each capable of taking several values, that are used to generate the items on the right.

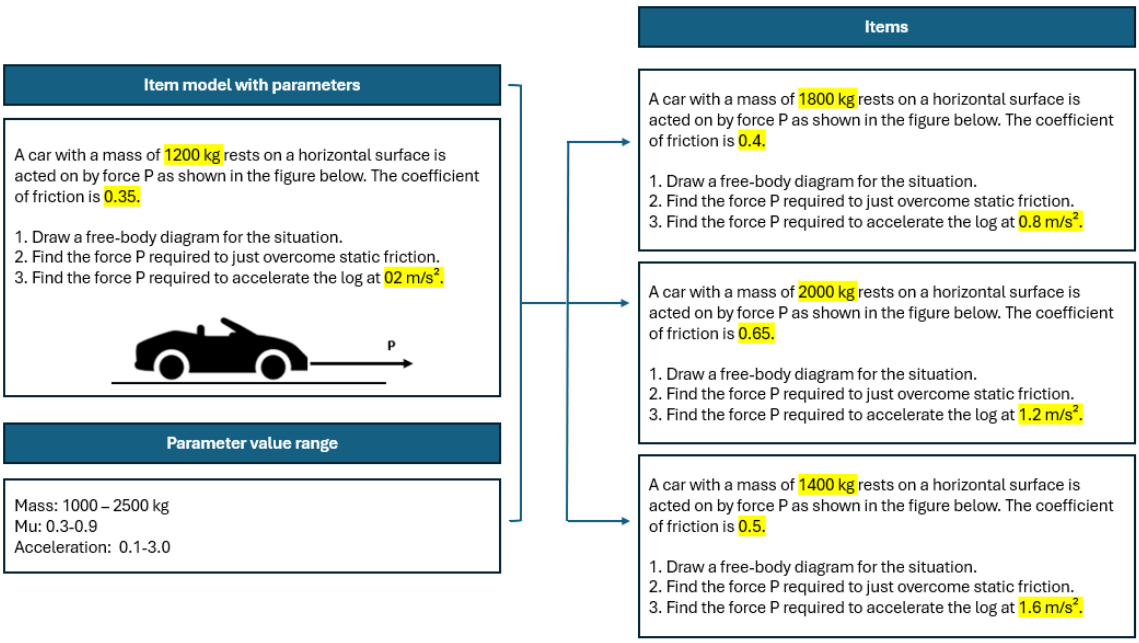


Figure 1: An example of an item model and items. © The Authors

Item repetition is a significant concern when developing multiple versions of a test for small item banks as shown by Murdock and Brenneman (2020), and in particular in summative assessment contexts where academic integrity must be preserved. When the same items appear too frequently across different versions, the risk of memorisation, sharing, or online dissemination increases substantially. This undermines the fairness and validity of the assessment process.

The critical question is: What is the optimal size of the item bank that can support these requirements while keeping development costs as low as possible? Expanding the item bank is often proposed as a solution to minimise item replication and similarity (Georgiadou et al., 2007; Rudner, 1998; Şahin & Weiss, 2015,). However, larger item banks also increase development effort and cost.

This project implemented an approach aligned to one proposed by Elkhatat (2022), who introduced a structured random selection method using sub-pools to reduce item repetition and improve test integrity. The author conducted a design-based study in a Blackboard LMS environment, developing a 10-question test composed of categorised question blocks. These blocks were intended to ensure content balance while supporting controlled randomisation. By generating 600 unique test versions, Elkhatat (2022) simulated repeated test attempts and analysed the frequency and distribution of item repetition and sequence predictability. The results demonstrated that structured random selection from well-organised sub-pools significantly reduced both repetition and predictability, thereby enhancing exam integrity. Building on this approach, a strategy was planned in which each question position in the test was supported by one sub-pool of 10 items.

This led to the next critical question: How should these items be generated? To address this, an item modelling approach was adopted. To balance development cost with item diversity, the project established a guideline of developing three item models per question, with 3 to 4 item variants generated from each model. This approach ensures sufficient variation while maintaining efficiency. Based on this structure, the item bank size was planned as outlined in Figure 2 and Table 2.

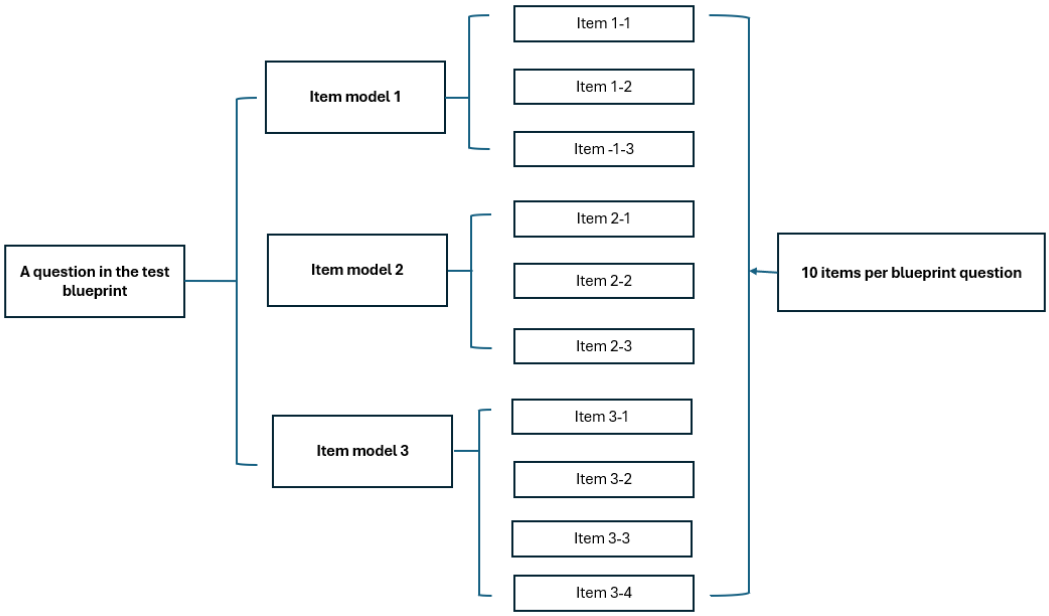


Figure 2: Item model and items for a question in the engineering assessment paper. © The Authors

Table 2: Proposed item bank size.

Test	Number of questions	Number of item models	Number of items
1	8	24	80
2	6	18	60

The item bank was developed in Excel, where formulas were applied to generate variables using vlook up tables and randomisation within determined parameters. To compile the items in a structured item database, Excel VBA (Visual Basic for Applications) macros (a set of custom instructions to automate tasks within Excel) were created with the aid of generative AI tools, including an in-house tool and ChatGPT. The macros were run from a user interface that allows users, such as Learning Designers (LDs), to generate items dynamically (see Figure 3). The database stores the questions and their associated components, such as model answers, tables, and images.

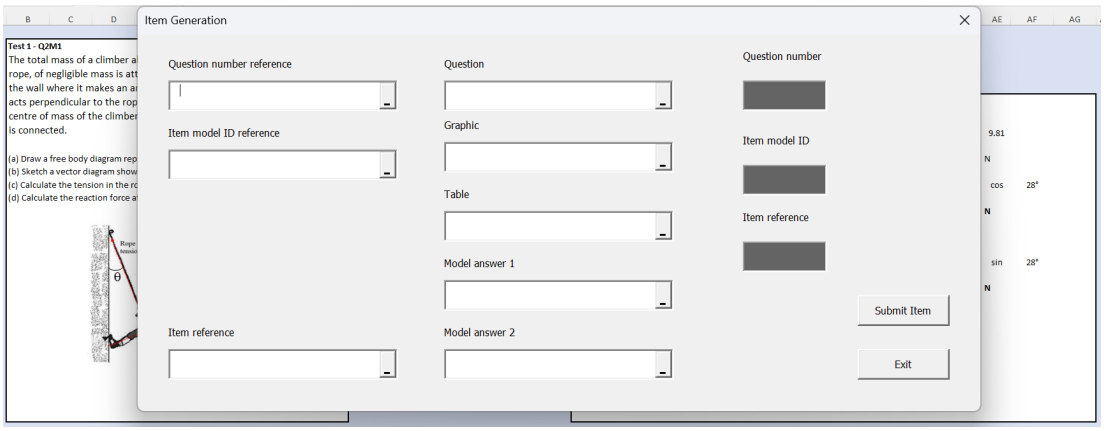


Figure 3: User interface used to capture the items © The Authors

Step 5: Mapping Distribution to Control Exposure

This step involves mapping the generated items and managing item exposure to prevent significant replication between generated papers. At present, there is no universally accepted standard for what constitutes an acceptable item repetition threshold. After reviewing the relevant literature and considering the specific constraints of the OPNZ context, a 20% maximum item overlap threshold based on the following considerations was adopted:

- The assessments are summative, so maintaining integrity and security is essential.
- Test papers will be uploaded to the LMS for learners to download and complete, increasing the risk of unauthorised sharing.
- The aim is to produce 100 unique versions of each test.
- The number of questions per test ranges from 6 to 15.

An Excel VBA tool was developed—coded with the assistance of generative AI—to map the distribution of items and control replication, ensuring it remains below 20%. By establishing a target item replication threshold of less than 20%, this meant that for any pair of test papers generated from the item bank, no more than 20% of the items are repeated. Based on this guideline, the generated items were mapped accordingly to construct a total of 60 distinct test papers.

Step 6: Deploying Test Papers

This step involves assembling the test papers into a format ready to present to learners. The tests were assembled in Microsoft Word using the previously mapped test data stored in the Excel database. A Word VBA macro, developed with the help of generative AI, was used to generate 60 tests for deployment. Two Word documents were created, the first document included 60 versions of the test, each containing only the learner-facing components such as instructions, graphics, and mark allocations. The second document was designed for markers and included all learner-facing elements along with model answers to support consistent and accurate marking. The LD was responsible for transferring these versions into the OPNZ assessment template and ensuring they meet the editorial standards required for summative assessments at the institution.

The exact number of valid versions that can be generated is determined by the test map tool mentioned in the previous section, with the existing number of item models and items. We were able to produce 60 versions of each test with less than 20% replication since the item models are reusable; additional items can be generated at a very low cost within this system, making it easy to create more versions of the test papers as needed.

Quality Assurance Mechanism

Ensuring the validity and reliability of an assessment item bank is essential for producing fair and meaningful assessments. Alongside the six-step sequential approach, a quality assurance mechanism that spans across all steps to ensure consistency and reliability throughout the process was defined and supported. This mechanism involved implementing targeted strategies to uphold these qualities throughout the development process. To meet the quality requirements of summative assessment, five checkpoints were established, each addressing a specific aspect of quality assurance. Table 3 provides an overview of these checkpoints.

Table 3: Item-bank quality checkpoints

Stage	Checkpoint	Internal/external	Focus
Pre-banking	The assessment coverage and test blueprint are reviewed and approved.	Internal (Academic Staff Member – ASM)	Alignment, balance, and comprehensiveness of the coverage.
	The sample paper is pre-moderated.	External (Moderator)	Alignment, workload, question quality, and correctness of the model answer.
	The learner's test result is reviewed after the trial administration, and the paper is subsequently revised.	Internal	The performance of benchmark questions in the test paper. Refine item model requirements.
Banking	The newly developed item models are reviewed.	External (contracted SME) Internal (ASM)	Review cognitive demand and difficulty levels. Confirm that each item model matches the cognitive and difficulty level of the benchmark question. Check that each item parameter (e.g., number ranges, units, tolerances, case data, or context constraints) is correctly defined (parameter specification). Ensure the correctness of the model answers. Verify the randomisation setup to ensure it accurately reflects the specified parameter values and constraints.
	Editing	External (Editor)	Clarity of the wording and instructions.
Deployment	The papers generated from the bank are reviewed	Internal (ASM)	Paper coherence and flow. Verification of technical correctness and answer accuracy.
	The papers are edited	External (Editor)	Ensuring editorial and formatting standards of OPNZ are met.

Three tests out of 60 produced for both test 1 and test 2 will be moderated as part of the final evaluation of the project outcomes.

DISCUSSION

Blueprint Driven Approach

An AI-supported analysis of the existing papers revealed significant inconsistencies in assessment scope, mark allocation, and complexity levels. These inconsistencies are likely attributable to two main factors:

- The assessments were developed by different SMEs, each with varying interpretations of the intended learning outcomes.
- While the underlying component skills and knowledge being assessed may be consistent, they are often combined in different ways across assessments.

Due to these issues, reusing existing items to build an item bank proved challenging. As a result, all assessment items were developed from scratch. In practice, for the DE4101 item bank development starting from scratch proved to be a more cost-effective and manageable approach. This significant inconsistency also highlights the importance of the test blueprint in the item bank development process. A well-constructed blueprint is a powerful tool for achieving this alignment and enhancing the overall quality and validity of assessment (Ismail et al., 2020; Van der Linden et al., 2000) and also ensures consistency among the generated papers. However, developing a robust blueprint is not without challenges. For instance, Ismail et al. (2020) note that the process requires consensus among stakeholders, and Downing (2006) pointed out the delicate balance between comprehensiveness and practicality.

Feedback from the ASM after the paper review (in the deployment stage) highlighted that blueprinting constrained the design of engaging and varied assessments by limiting how skills are combined. To address this, further exploration is needed into the use of multi-layer randomisation during test assembly. Such an approach could preserve blueprint alignment at the structural level while enabling interchangeable combinations of sub-skills and diverse scenarios, ultimately supporting both validity and creativity in assessment design.

Bank Size and Exposure Control Mechanism

Unlike other studies that used the built-in randomisation mechanisms of LMSs (such as Elkhatat's (2022) study), the project developed an algorithm with the aid of GenAI and implemented it in Excel. This approach provided greater flexibility, allowing control of the item replication threshold, the number of item models, the number of items generated from each model, the questions per test, and the number of test papers. It works by creating a test map, a structured framework that determines how test papers are generated from the items stored in the Excel database. The test map allows the user to preview the question IDs for each test paper before generating the full set of tests. It is possible to also regenerate the map multiple times before finalising the test papers. This provides significant flexibility and control over the exposure mechanism.

The implementation of exposure control mechanisms plays a critical role in determining the optimal size of the item bank. With strong exposure control in place, there is no need to build excessively large item banks; instead, allowing focus to be on maintaining a strategically sized pool of high-quality, well-distributed items that can support multiple test forms while preserving fairness and integrity. This enables more efficient item development and cost reduction without sacrificing assessment reliability or security.

Although the initial approach involved creating at least 3 item models for each question for each test as shown in Table 2, due to various constraints, the actual number of item models developed per question ranged from 1 to 9. These were used to generate 10 to 21 unique items. This variation in item models and items reduced the total number of tests to 60 actual tests. It is worth noting that, had 3 to

4 items per item model been developed as initially planned, the total number of items generated would have exceeded 100, as discussed later in this section.

During the test paper review process, the ASM identified four questions that exhibited issues with high similarity across test versions. Notably, all of these questions were supported by only one or two item models, highlighting a clear correlation between limited model diversity and item repetition. This finding reinforces the importance of developing at least three item models per question to ensure sufficient variation and maintain the freshness of the generated test papers.

Randomise Complex Question Items

MCQs remain the dominant item type in item banks to date. They are generally easier to manipulate during both item bank development and test assembly, which contributes to their widespread use in digital assessment systems. Construct-response questions are rarely used in item banks for several reasons, such as the need for manual scoring and the difficulty of categorising them consistently. A key challenge is that their structures are often diverse and not easily parameterised, making them less compatible with automated generation workflows. However, the constructed-response items in the OPNZ engineering tests are primarily numerical and calculation-based, which makes them well suited for parameterisation. The main challenge lies in the complex formatting of these items as they often involve multiple elements such as diagrams, tables, and mathematical formulas. These components make automation and standardisation more technically demanding, despite the relatively simple logic behind the content itself.

The OPNZ solution involved using Excel randomisation formulas to dynamically generate items from each item model, along with Excel macros to capture and store these items within the same environment. These tools proved valuable in managing the complexity of assessment item development, especially for numerical and multi-element question items. However, the process still relies on manual input to define the parameter value range and set up the randomisation rules, which increases the potential for human error. Following the first trial run, 6 test papers were randomly selected with their corresponding model answer documents for review. 46% of the identified issues stemmed from incorrectly configured randomisation rules, invalid value ranges, or inappropriate parameters defined in the item model bank. To mitigate these risks, it is essential to establish and follow a clear, consistent checklist at each stage of the development process, particularly during item model validation and randomisation setup to minimise errors in the final test outputs.

The Technological Solution

As discussed in the literature review, achieving a streamlined solution from item generation to test assembly and paper-based deployment poses significant practical challenges. However, with the rapid development of generative AI tools, it is possible to build Excel and Word macros to generate, manage, and distribute assessment items using the existing expertise of learning designers. GenAI played an important role in coding the macros. As a medium-sized institution, it was not possible for OPNZ to hire an expert in VBA, but the support provided by generative AI tools enabled the creation of a functional and customised solution.

While these tools have been effective in addressing some challenges, they are not without limitations. Most of the components of an item, such as model answers, tables, and images, are inputted as image types in the Excel database. This caused issues when generating the final versions of the tests, as the

computer ran out of memory. Although we found a workaround for this issue, future work should explore better ways to store item data to avoid such problems.

Development Cost Comparison

Reducing development costs was a primary objective of this project. At the conclusion of the project, a cost analysis was conducted to compare the estimated development costs of the new approach with current manual processes. The analysis considered the total development costs across four key stages of the item development process, including pre-banking, banking, test assembly, and deployment. The cost estimation was based on a medium-complexity scenario involving the following parameters:

- **Item bank size**: The project focused on a test containing 10 questions, with three item models per question, generating a total of 100 items.
- **Item type:** Open-ended questions requiring numerical or calculation-based responses.
- **Development team:** The team included a project manager, a LD with assessment expertise, two LDs supporting the development of macros and Excel formulas, a SME, and an ASM.

Per test cost

The project compared the cost of generating test papers using three approaches:

- **Approach A:** The conventional method, where a LD collaborates with a SME to develop tests from scratch.
- **Approach B:** A manual variation approach, where a SME creates variations of existing test papers.
- **Approach C:** The new automated test generation system developed in this project.

The results showed that the automated system (Approach C) has the potential to reduce OPNZ development costs by up to 72% when comparing the cost of producing a single test using the conventional approach, and by 57% compared to manual variation development. This is based on the average cost for the 60 tests produced from the item bank. These savings highlight the scalability and cost-effectiveness of the new system, particularly for institutions producing large volumes of test papers.

Per item model cost

The development of high-quality item models is critical to the success of the automated system. Each item model needs to align with intended learning outcomes, support parameterisation for item generation, and maintain consistency in assessed skills, cognitive demand, and difficulty level. The item model process involved two main stages. First, a benchmark item model was developed and trialled through a structured workflow that included defining assessment coverage, blueprinting, creating sample papers, conducting trials, and gathering feedback. Once the benchmark model was finalised, two additional item models were developed for each question outlined in the blueprint. On average, the development of an item model required approximately 4.8 hours of work. Given that AIG approach generally requires more time and expertise than traditional item writing (Kosh et al., 2019), this figure appears reasonable. For SMEs who are new to item modelling, or for more complex item models, the actual development cost is likely to be higher.

Scalability

Currently, the OPNZ pilot system is able to generate 60 test papers with less than 20% item replication. Increasing the number of item models and items will enable the generation of additional tests. Figure

4 estimates the maximum number of 10-question tests that can be generated using item models with 5, 10, and 15 items, assuming each model produces 3, 10, and 15 items, respectively. The estimates were calculated using the same exposure control algorithm applied in step 5. These figures demonstrate that, even with a moderate number of items and item models, a substantial number of test papers can be produced by the system developed in this project.

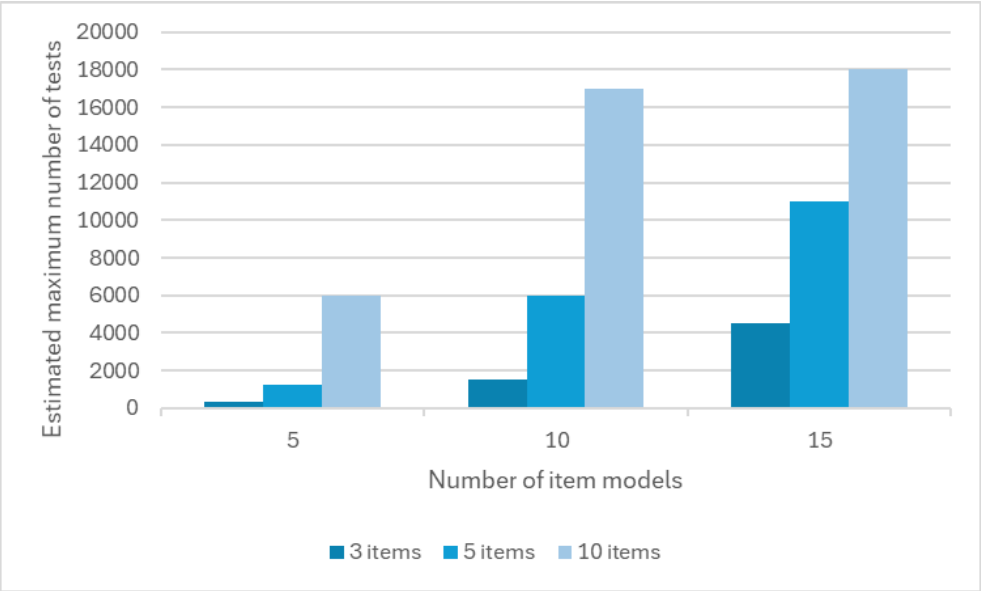


Figure 4: Estimated maximum number of tests as a function of item models and items.

The approach followed in this project can be applied to the generation of assessments in other courses, as long as the question variables or parameters can be identified and randomised to create new items from an item model. This adaptability makes the approach suitable for various courses, while the Excel macros provide additional functionality. The macros can capture input data, including text, numerical values, and images from any assessment, as long as the data is in Excel format. Assessment papers can then be generated using a map, with the algorithm leveraged to manage item exposure and ensure a balanced distribution of items across a test.

CONCLUSION, IMPLICATIONS AND SUGGESTIONS

This paper has presented a template-based AIG approach built on a hybrid six-step workflow, which relies on automation through Excel and Word macros and Excel's built-in randomisation formulas to generate tests. The approach was applied to an engineering course as a pilot to define future automated assessment generation processes. The initial findings are promising and show that we can generate a substantial number of tests, even with a reasonable number of item models and items, while reducing the costs involved in test generation and providing high scalability. This scalability applies not only to the number of possible tests but also to the potential application of the approach to assessments for other courses.

The issues observed after applying the proposed approach with a full item bank were primarily due to human errors, which are understandable given that the process still relies heavily on manual input. These issues highlighted the importance of implementing the process correctly and adhering to quality assurance mechanisms.

The use of GenAI proved valuable in creating macros for automating certain steps in the proposed approach. This allowed the development of a functional tool without requiring the support of a software developer, instead leveraging Excel's embedded VBA programming. This saved time and reduced development costs. However, technical limitations were identified, including the system running out of resources during the generation of final tests. In the future, exploring alternative data storage methods or adopting more suitable programming languages, such as Python, may be necessary, as they can offer advanced features for data storage and test generation.

It was also found that some key stakeholders were not sufficiently engaged in the development process, resulting in misunderstandings about how the system worked and the importance of their roles. This may have been due to communication issues. Improved communication to key stakeholders on their role and the importance of it within the development process will result in smoother processes, reduce resistance to change caused by the new automation process and enhance quality of future products. In the future, it will be essential to engage all stakeholders effectively and adopt a more agile and flexible development approach.

The current method for data input through the user interface is tedious which increases the likelihood of human errors. In future, improving the interface to streamline this process can decrease errors. For the system to function effectively, it is critical to avoid duplicated items. Currently, this checking must be done manually, which can lead to errors, particularly as the number of items increases.

Based on the results of the pilot project, the OPNZ plans to apply this approach to generate assessments for other courses. Additionally, exploration of how this approach can be integrated into OPNZ's LMS (iQualify) to further enhance its scalability and usability is intended.

AUTHORS' NOTES

The authors acknowledge that this manuscript was reviewed, edited, and refined with the assistance of generative AI tools, including OpenAI's ChatGPT, GitHub Copilot, and an in-house GenAI tool. Connected Papers was also used to support the identification of relevant literature.

Authors' Contributions

Luchen Xia: Conceptualisation, Methodology, Data Analysis, Writing; Maria Elena Villapol: Software Development, Methodology, Writing; Cynthia Ogilvy: Conceptualisation, Methodology, Review & Editing

Data Accessibility Statement

The data supporting the findings of this study are available within the Open Polytechnic document management system. Due to institutional restrictions, the data are not publicly available but can be provided by the authors upon reasonable request and with permission from the Open Polytechnic of New Zealand.

Ethics and Consent

As the data used in this study were drawn anonymously from institutional systems and did not involve direct interaction with human participants, formal consent and ethics approval from learners were not required.

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Is Open, Distance, and Digital Education (ODDE) good for the environment? A systematic review of carbon footprint studies

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ABSTRACT

This study presents a systematic review of research on the environmental sustainability of Open, Distance, and Digital Education (ODDE), focusing on its carbon footprint. Although higher education institutions (HEIs) are expected to reduce greenhouse gas emissions, the environmental impacts of teaching and learning modes remain underexplored compared to campus operations. To address this gap, 17 studies published between 2002 and 2025 were examined. The evidence shows that ODDE typically generates far lower emissions than campus-based education, mainly by reducing travel, minimizing campus energy use, and benefiting from centralized delivery. Landmark studies reported reductions of more than 80% compared to face-to-face teaching. Studies conducted during the COVID-19 pandemic confirmed significant savings but also highlighted rebound effects, as household energy use increased while campus facilities continued to consume resources. Emerging technologies, particularly generative AI, further complicate the picture due to their high energy demands. Overall, the evidence suggests that ODDE can contribute positively to reducing the carbon footprint of higher education. However, the small number of studies, lack of standardized methodologies for carbon footprint assessment (CFA), and limited attention to rebound effects constrain broader generalization. Future research should systematically compare different delivery models across diverse institutional contexts and develop shared CFA guidelines. Strengthening the sustainability profile of ODDE is of critical importance, not only for the higher education sector but also for advancing global climate goals.

Keywords

Open, Distance, and Digital Education; ODDE; sustainability; carbon footprint; greenhouse gas emissions, systematic review

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