Designing and Delivering a Fully Online Course on Generative Artificial Intelligence for Educators: Lessons from Eswatini

Abstract

This paper outlines the conception, implementation, and evaluation of a fully online professional development course on artificial intelligence for educators at the University of Eswatini. This study represents the first empirical analysis of a larger research program, drawing on data gathered from the two most recent cohorts. Conducted over five weeks between October and November 2024, it serves as the initial phase of a broader, ongoing research initiative. The initiative reached approximately 250 educators across two cohorts. Designed to address critical gaps in AI literacy, the course combines asynchronous self-paced modules, synchronous demonstrations, collaborative activities, and hands-on practice with generative AI tools, all within a mobile-friendly, low-bandwidth framework suitable for resource-constrained contexts. Employing a mixed-methods evaluation, the study collected quantitative survey data on AI tool usage, educator confidence, student engagement, and resource optimization, alongside qualitative feedback on participant experiences and implementation challenges. Findings reveal significant challenges in AI literacy transfer, with barriers including technical infrastructure limitations, institutional policy gaps, and skills confidence issues. Key innovations include leveraging existing platforms for delivery, integrating freely available AI tools to minimize costs, and establishing support systems for sustainable adoption. This research provides evidence-based online course delivery methods for technology-focused professional development in resource-constrained settings, as well as practical strategies for scaffolding AI integration across diverse student learning contexts.

1. Introduction

The University of Eswatini (UNESWA), recognizing the transformative potential of artificial intelligence in education, has launched initiatives to equip its educator community with AI knowledge and skills. This has led to the development of the "Generative AI for Educators" online course through the UNESWA AI Academy, demonstrating UNESWA's commitment to embracing new technologies within Eswatini's educational system.

This short online course addresses the clear need to build technical, technological, and pedagogical skills among educators in Eswatini. While awareness of technology's importance in education is growing, many teachers, school principals, staff from the Ministry of Education and training, and other stakeholders still face barriers to digital literacy and training opportunities. The course tackles this challenge by offering a program specifically designed for teachers, lecturers, trainers, professors, and educational administrators.

1.1. Research Objective

This study is grounded in the Theory of Transfer of Learning, which emphasizes the importance of applying knowledge and skills acquired in one context to a different, often real-world, environment. The "Generative AI for Educators" course presents a timely intervention aimed at building educators' AI competencies. However, true success lies not merely in knowledge acquisition but in the extent to which that knowledge is transferred to teaching practice, curriculum development, and educational leadership. The following research questions are examined:

RQ 1: To what extent does participation in the "Generative AI for Educators" course show educators' ability to transfer AI-related knowledge and skills into their teaching approaches and work application?

RQ 2: How do participants rate the usefulness and relevance of the course content to their daily professional responsibilities?

RQ 3: What is the self-reported confidence level among participants in using generative AI tools after completing the course?

RQ 4: What are the most commonly reported barriers participants face in applying Generative AI after the training?

2. Literature Review

2.1 Transfer of Learning

The theory of Transfer of Learning is central to understanding how training outcomes manifest in real-world settings. Perkins & Salomon (1992) define transfer of learning as the extension of what has been learned in one context to new contexts. The theory of transfer of learning remains central to explaining how training outcomes appear in authentic educational settings. Recent studies in teacher and faculty development continue to converge on three interacting determinants of transfer: trainee characteristics, training design, and the work/learning environment, particularly when professional learning is expected to move into practice (Schuster et al., 2024; Surikova et al., 2025; Sims et al., 2025). The Generative AI for Educators course offered by UNESWA exemplifies this model by combining skill-building with immediate course application in a supportive online environment.

Furthermore, "near" transfer denotes applying skills to structurally similar tasks, whereas "far" transfer requires adapting what was learned to dissimilar contexts (e.g., different strategies or settings). Evidence from recent educational psychology and learning-technology research confirms both the difficulty and necessity of far transfer for meaningful innovation (Schuster, Spörer, & Brunstein, 2024). In the context of generative AI, far transfer refers to moving beyond basic text generation to applications such as collaborative lesson planning, differentiated materials, or automating administrative tasks, patterns already observed in current teacher practice studies (Liu, Jiang, Lai, & Jin, 2024; Kim, 2025).

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2.2 Online Learning and Design for Transfer

Online learning environments provide a scalable way to transfer knowledge in resource-limited settings like Sub-Saharan Africa. However, ongoing issues with connectivity, affordable devices, and supportive policies mean that designs must be deliberate (World Bank, 2024). Summaries of technology-enabled online professional development (OPD) show that meaningful improvements happen when programs include interactivity, collaborative support, real job-related tasks, and opportunities for reflection, rather than just passive content delivery (Stavermann, 2025). Using authentic, context-relevant activities can boost retention and the ability to apply knowledge in online courses (Martínez-Argüelles, Plana-Erta, & Fitó-Bertran, 2023). Aligning tasks with actual work also helps reduce extraneous cognitive load, allowing more mental resources for deep learning and transfer (Skulmowski & Xu, 2022). Lastly, adding social-constructivist elements like peer collaboration, co-constructing knowledge, and metacognitive reflection further promotes lasting transfer beyond the course (Chen, Gao, & Jiang, 2025).

2.3 Transfer Challenges and Opportunities in African Education Contexts

Educator professional development in Africa often faces structural and contextual barriers that limit transfer. These include inadequate ICT infrastructure, lack of policy coherence, poor follow-up support, and cultural mismatches in training design (Popova, Evans, Breeding, & Arancibia, 2022; Mitchell et al., 2024; World Bank, 2024). However, opportunities for transfer exist when training aligns with national priorities—such as digital curriculum reform or localized teacher certification goals—and when programs are deliberately contextualized to educators' realities (Global Partnership for Education & KIX, 2024; Mahlo, Waghid, & Chigona, 2024).

Self-efficacy, an individual's belief in their capability to perform tasks, strongly predicts whether educators apply what they learn in training. In the context of AI, where anxiety and uncertainty are high, fostering confidence is crucial (Klassen, Tze, Betts, & Gordon, 2024; Gao, Chen, & Jiang, 2025). Recent meta-analyses and intervention studies have shown that targeted strategies—such as scaffolded practice, mastery experiences, and modeling—can significantly boost transfer rates by elevating teacher self-efficacy (Klassen et al., 2024).

The sustainability of knowledge transfer requires ongoing support and community reinforcement, which can be effectively leveraged through digital platforms like WhatsApp and Moodle forums. WhatsApp provides real-time communication and informal peer-to-peer support, while Moodle centralizes course content and enables structured discussions (Suárez-Lantarón, García-Peñalvo, & Sánchez-Prieto, 2022; Wati, 2024; Mahlo et al., 2024). These low-bandwidth, widely available tools extend instructor guidance and maintain momentum after formal training ends (Mitchell et al., 2024).

2.4 Recent Advances and Gaps

Recent advances in AI education have significantly enhanced the potential for effective transfer of learning through AI-driven personalization, intelligent tutoring systems, and learning analytics (Singh et al., 2025). However, research continues to highlight key gaps that hinder successful transfer. Park (2024) emphasizes that rapid AI deployment is not always accompanied by sufficient attention to training environments that support long-term behavioral change. Furthermore, Aly et al. (2025) identify trust and usability barriers as central issues.

2.5 Course Design

The AI for Educators is a four-week, fully online program designed for a wide range of education professionals, including teachers, lecturers, tutors, trainers in NGOs and corporate environments, educational leaders, and ed-tech enthusiasts. The learning objectives focus on enabling participants to understand the fundamentals of Generative AI, create AI-powered instructional content, address ethical issues, communicate effectively with AI, incorporate AI into classroom practices, and explore AI for research purposes.

The program combines expert-led interactive sessions with hands-on projects and collaborative activities. The design targets approximately 10 hours of flexible engagement per week, with enrollment capped at 50 participants to preserve an intensive, high-touch learning environment, and culminates in a formal certificate upon completion. These design choices, clear topical modules, intentional pacing, active application tasks, and cohort limits offer a replicable blueprint for institutions seeking to develop comparable professional learning experiences in Generative AI.

The course lessons, assessments, and administrative workflows were developed using backward design and Universal Design for Learning (UDL) principles. AI tools, videos, and teamwork were integrated into the instructional context, along with academic integrity guidelines. The course design ensured documentation of transfer evidence by customizing course products to address real problems and outlining plans to maintain and expand innovations after the program.

3. Methodology

3.1. Research Design

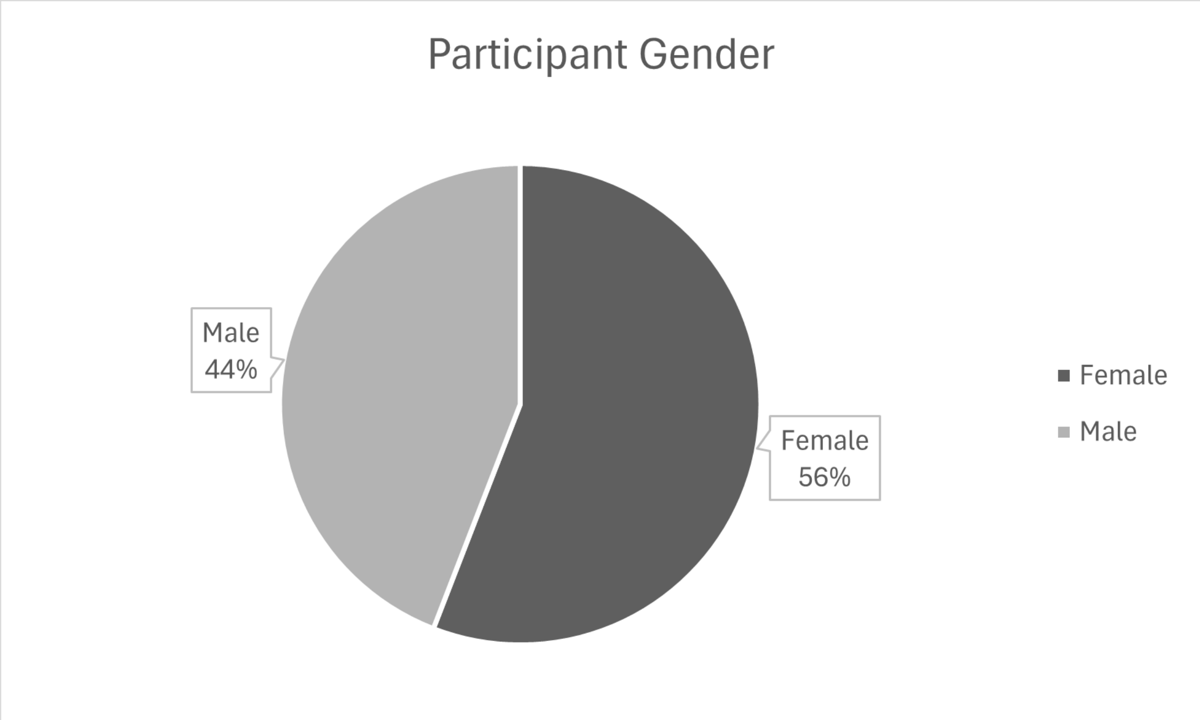
Our study is part of a larger research project and is the first to be empirically evaluated. This study employed a mixed-methods approach to evaluate the perceived learning outcomes, application of knowledge, and barriers to implementation following participation in the course. The study used convenience sampling, selecting participants who are easily accessible and readily available (Etikan et al., 2016).

Participants' responses were collected over a three-week period. The survey comprised constructs that had been validated in prior research and demonstrated sufficient validity and reliability. The survey items were derived from highly regarded prior literature in Education and Learning (Byrd, Gallagher, & Habib, 2022; Utsumi et al., 2025). The validity and reliability of all constructs were above the threshold of .70.

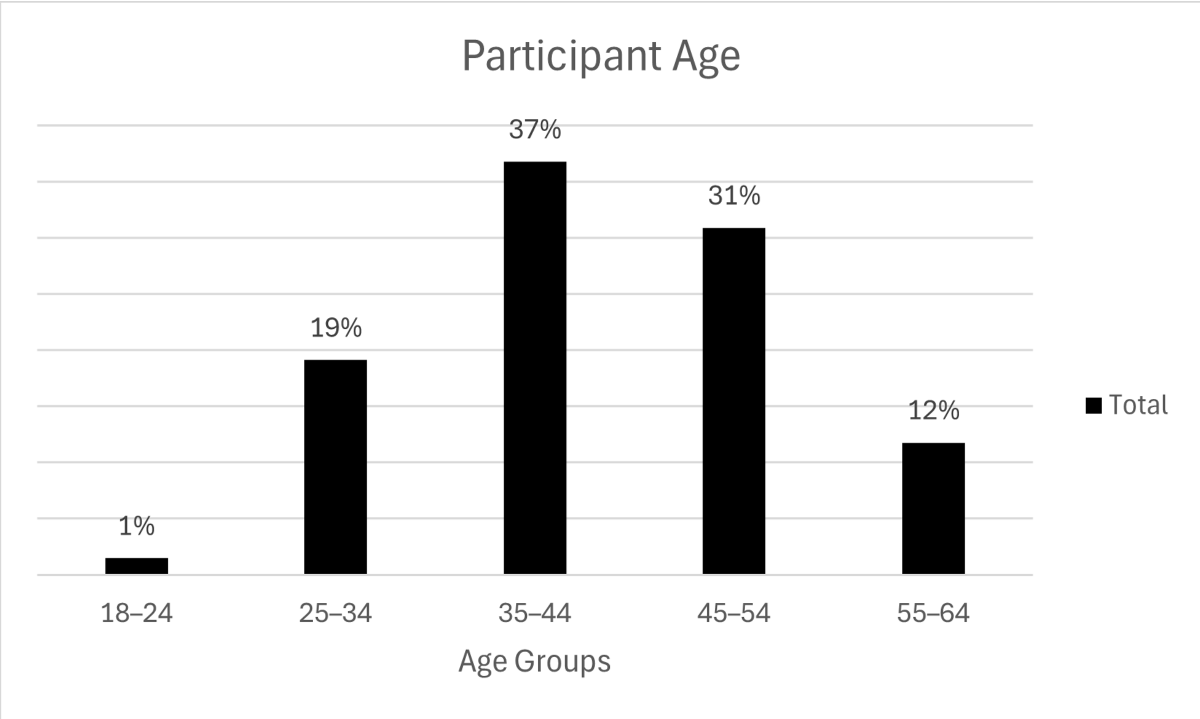
Each construct, Perceived Learning Gains (Byrd, Gallagher, & Habib, 2022; Utsumi et. al., 2025) and Transfer of Learning (Gegenfurtner & Testers, 2022; Wintersberg et al., 2025) items were measured using a 5-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The survey concluded with open-ended questions that invited participants to elaborate on their experiences, challenges, and success stories.

3.2. Sampling and Participants

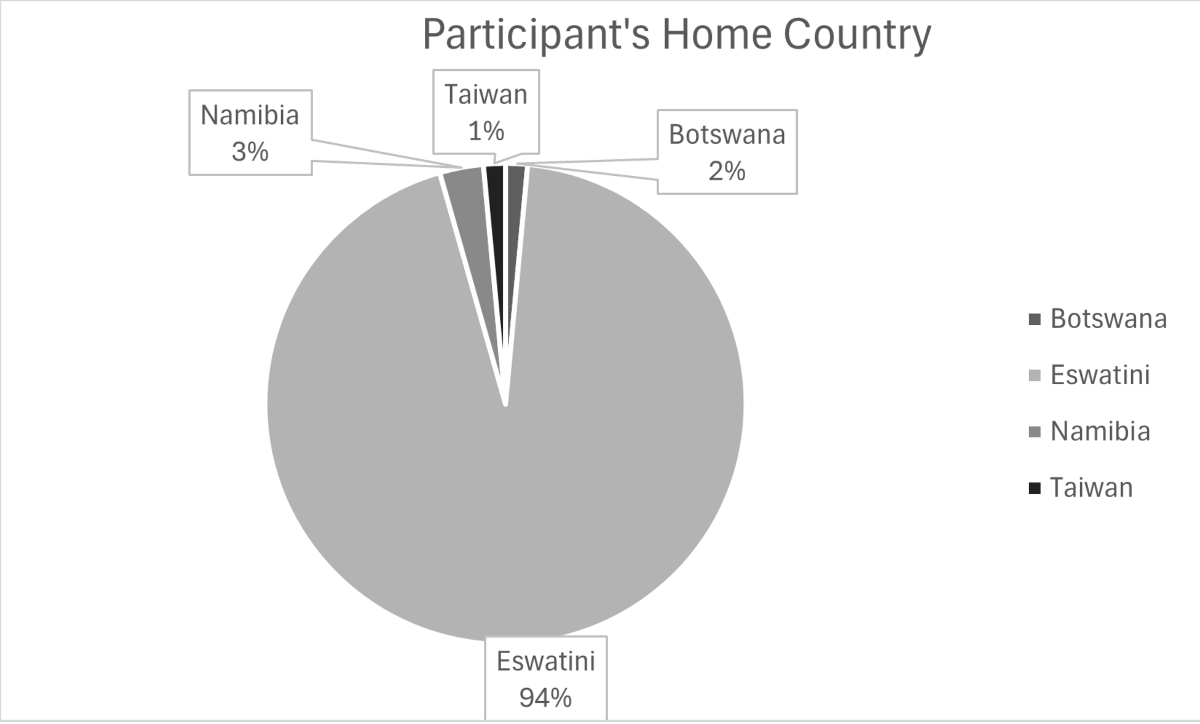
Seventy-three participants completed the survey. The participants were predominantly female (56%) and male (44%).



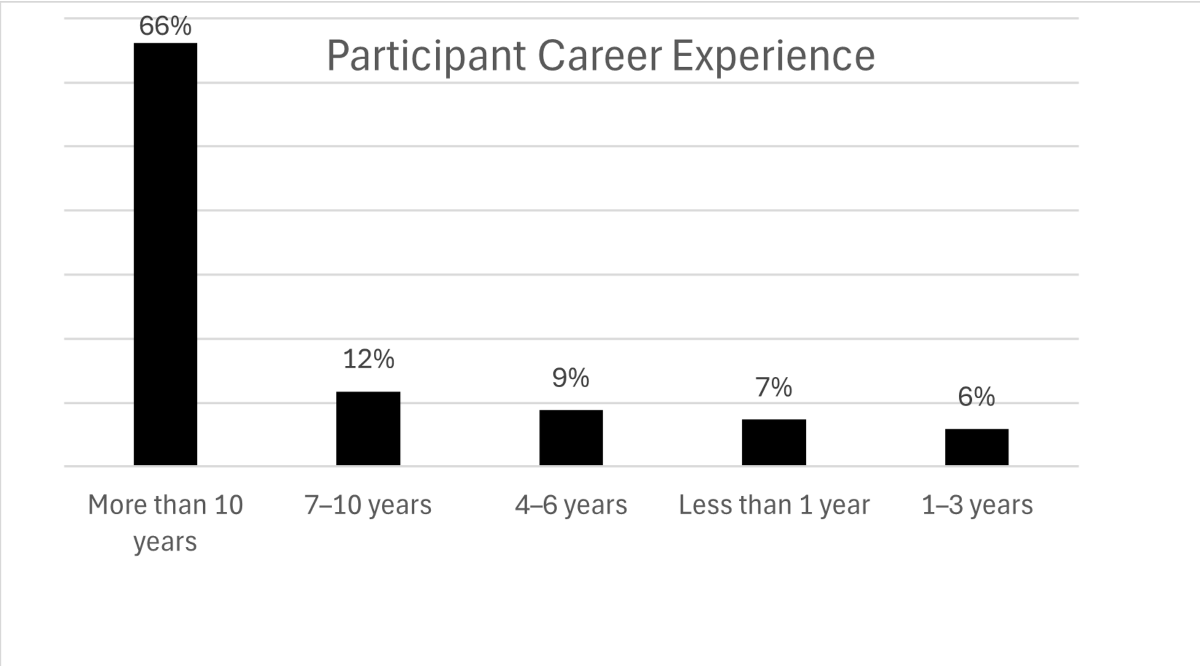
The largest age group falls within the 35-44 age bracket (25 participants), followed by the 45-54 age group (21 participants).



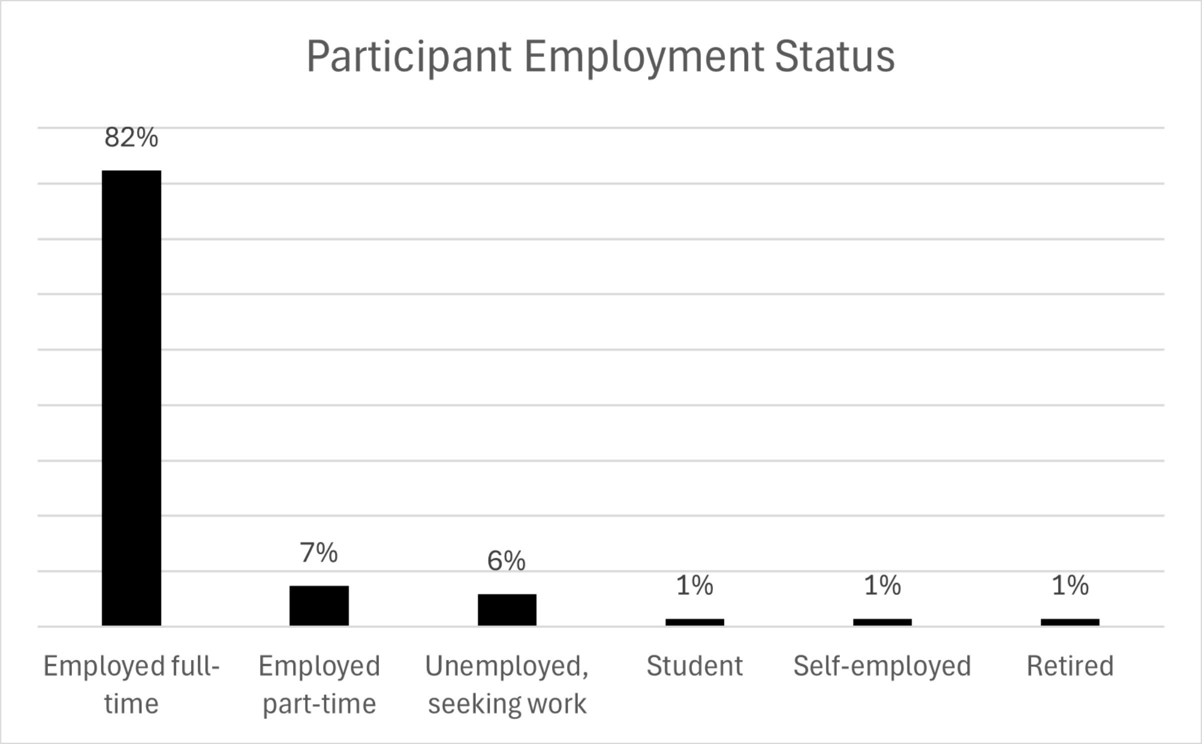
The vast majority of participants (94%) were from Eswatini.



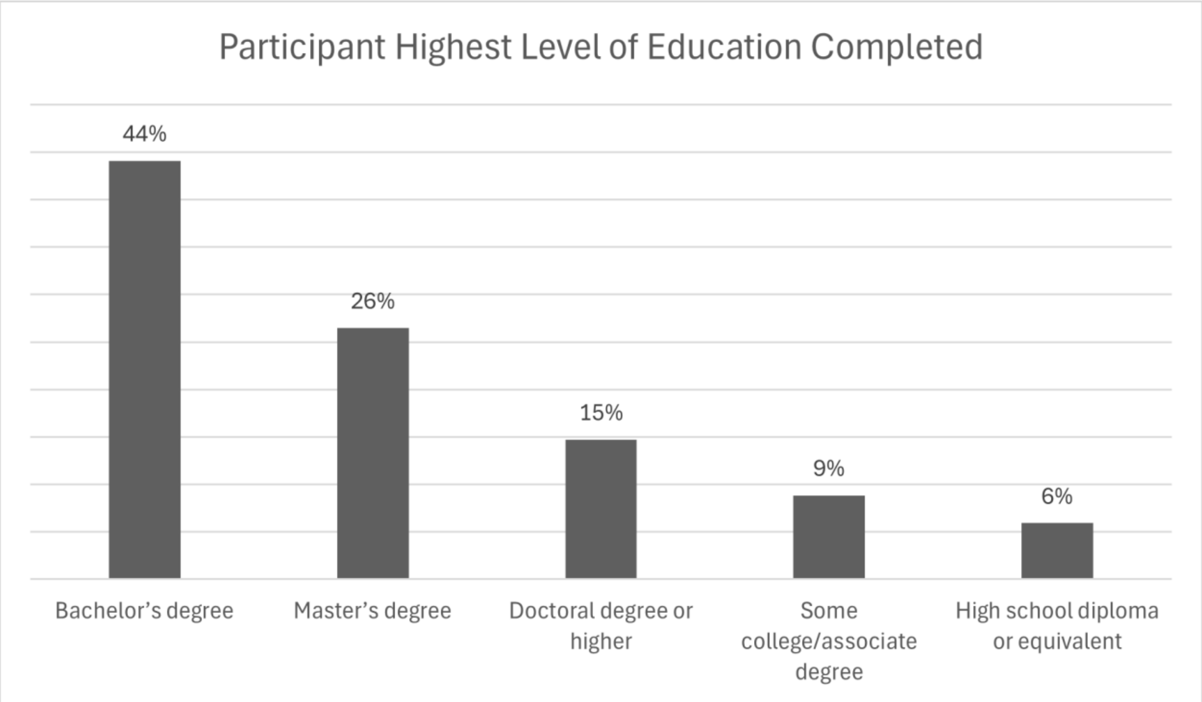
A significant portion had extensive career experience, with 45 individuals reporting more than 10 years of experience.



The majority were employed full-time (56 individuals), with the largest group holding a Bachelor's degree or higher.



The highest level of education completed among participants varied, with the largest group holding a Bachelor's degree or higher. Participants with a Master's degree followed this, and then those with a Doctoral degree or higher. A smaller number of participants had some college or an associate's degree, and the least number had a high school diploma or equivalent.



3.3. Data Collection Procedures

The researchers sent a Google Form survey via WhatsApp to the most recent participants in Cohort 1 (111 participants) and Cohort 2 (159 participants). The survey comprised 26 items organized into eight categories, with this paper focusing on perceived learning gains and application of learning.

Although formal IRB review was not required for this pilot under our institutional guidelines, we still followed standard ethical safeguards. Participants viewed a simple-language Google survey where explicit electronic consent was obtained before beginning the survey. Participation was voluntary and could be discontinued at any time. No personally identifying information was collected, and open-ended responses were checked to remove inadvertent identifiers. Data were stored on a password-protected, encrypted drive and are reported only in aggregate to preserve anonymity.

Perceived Learning Gains statements:

- I gained a deep understanding of the key concepts covered in this course.
- I can confidently explain the course material to others.
- The course enhanced my ability to solve problems using AI in educational settings.
- I feel more competent in applying AI tools introduced in this course.

Application of Learning statements:

- I have applied what I learned in this course in my classroom or professional setting.
- I look for opportunities to use the knowledge and skills from this course.
- The course content has influenced how I approach instructional design or problem-solving.
- I shared what I learned in this course with colleagues or peers.

3.4. Data Analysis Techniques

The analysis employed a combination of descriptive statistical techniques and visual analytics to summarize and interpret participants' responses to the 5-point Likert scale survey items. To enhance interpretability, findings were presented using bar charts and pie charts. Bar charts illustrated the frequency distribution of responses across each Likert scale point, helping to identify response patterns at the item level. Pie charts were used to highlight the proportion of the total.

All quantitative analyses and visualizations were conducted using Microsoft Excel and ChartPro for Likert scale data. These tools facilitated both tabular summaries and graphical displays, making the results accessible to a broad educational audience.

4. Findings

4.1. Summary Results

Perceived Learning Gains

The results revealed concerning patterns across all perceived learning gain dimensions:

1. "I gained a deep understanding of the key concepts covered in this course." - A significant majority disagreed (57.1% strongly disagreed, 25.7% disagreed), with only 7.2% agreeing or strongly agreeing.
2. "I can confidently explain the course material to others." - Confidence was extremely low (44.3% strongly disagreed, 31.4% disagreed), with only 4.3% agreeing and none strongly agreeing.
3. "The course enhanced my ability to solve problems using AI in educational settings." - Similar disagreement patterns (47.1% strongly disagreed, 22.9% disagreed), with only 7.1% agreeing or strongly agreeing.
4. "I feel more competent in applying AI tools introduced in this course." - Competence perception was low (44.3% strongly disagreed, 38.6% disagreed), with only 4.3% agreeing or strongly agreeing.

Figure 1 Summary for Perceived Learning Gains Likert Scale Results

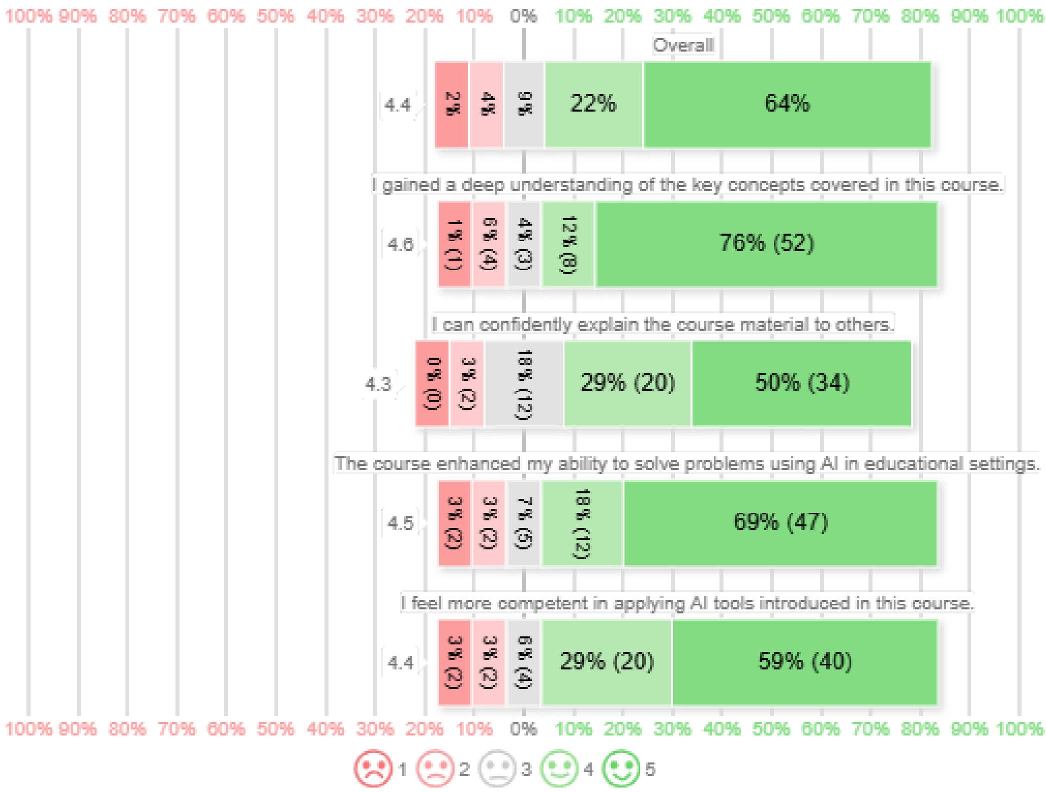
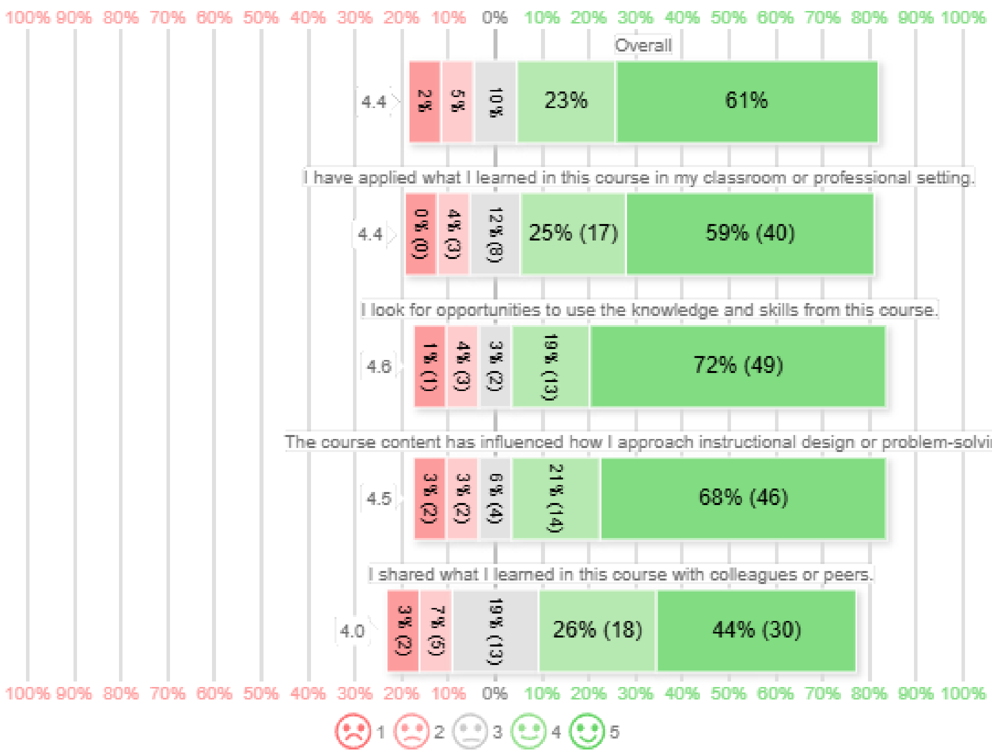


Figure 2 Summary for Application of Learning Likert Scale Result



4.2

AI Implementation Barriers and Success Factors

Figure 3 summarizes key barriers that hindered successful AI implementation in educational settings and the success factors that facilitated effective transfer and sustained use (Figure 4). Institutions can use this as a diagnostic or planning tool when scaling AI initiatives.

Figure 3 Barriers to Successful AI Implementation

Category	Details
Technical Infrastructure Limitations	• Poor internet connectivity and limited access • Lack of computer or laptop access in schools • Network availability issues and data (bandwidth) limitations
Institutional & Policy Barriers	• Lack of institutional AI policies and guidelines • Unsupportive work environments for AI tool usage • Limited institutional investment in technology infrastructure
Access & Cost Limitations	• Premium tool limitations with daily usage restrictions • Need for paid/licensed versions to access useful features • Limited access to advanced features in free tools
Skills & Confidence Gaps	• Need for more hands-on practice and experience • Lack of confidence in applying learned skills • Difficulty crafting effective prompts for desired outputs
Time & Opportunity Constraints	• Limited opportunities to apply learning in current roles • Time constraints balancing AI learning with workload • Evening-only access due to workplace limitations

Figure 4 Success Factors Enabling AI Implementation

Category	Details
Practical Application Areas	• Lesson planning and content creation • Assessment and evaluation • Research and writing • Administrative tasks
Key Learning Components	• Prompt engineering skills • Hands-on practice • Exposure to a diversity of tools
Effective Teaching Methods	• Real-world examples • Practical assignments • Peer learning opportunities
Support Systems	• Ongoing communication via WhatsApp groups • Continuous learning resources
Institutional Enablers	• Management support • Resource allocation • Policy development initiatives

5. Discussion

The survey responses highlight several significant hurdles to AI implementation in education, broadly categorized into technical, institutional, access, skill, and time constraints. A primary barrier identified is the inadequacy of technical infrastructure. Multiple respondents cited "extremely poor or limited internet access" and "lack of computer/laptop access." This aligns with literature emphasizing the foundational role of robust infrastructure for successful technology integration (UNESCO, 2021; Trust & Maloy, 2017).

Educators reported significant institutional obstacles, including "lack of institutional AI policies" and "unsupportive work environments." Research by Seldon and Macleod (2018) emphasizes the significance of institutional buy-in and supportive policies for implementing effective technological change. The survey revealed concerns about accessibility and cost of AI tools, with respondents noting "premium tool limitations" and the "need for paid/licensed versions." This aligns with broader discussions on digital equity in education (Popenici &

Kerr, 2017). A significant barrier was the gap in educators' skills and confidence. Participants expressed a "need for more practice" and "lack of confidence" in applying learned skills. These findings resonate with extensive literature showing that educators require ongoing training and opportunities to build confidence (Voogt et al., 2013).

Despite barriers, the survey highlighted practical application areas where AI can benefit educators, including lesson planning and content creation, assessment and evaluation, research and writing, and administrative tasks. These applications align with literature demonstrating AI's transformative potential (Luckin et al., 2016).

Key learning components that facilitate success

The survey identified specific learning components that contribute to successful AI adoption: "prompt engineering skills," "hands-on practice," "tool diversity exposure," "research applications," and "gamification techniques."

This underscores the importance of well-designed professional development programs that go beyond theoretical knowledge. Effective training should focus on practical application, allowing educators to experiment with various tools and develop critical skills like prompt engineering (Molnar et al., 2021). Incorporating gamification can also enhance engagement and motivation in AI learning (Huang et al., 2020).

Effective teaching methods for AI in education include "real-world examples," "practical assignments," "peer learning," and "continuous updates." These methods are consistent with best practices in adult learning and professional development. Demonstrating real-world applications helps educators connect new skills to their daily practice (Knowles et al., 2015). Peer learning fosters a supportive environment for sharing experiences and problem-solving, while continuous updates ensure educators remain abreast of rapidly evolving AI technologies.

The survey responses highlighted the importance of robust support systems, such as "ongoing communication" and a community of practice (González-Anta et al., 2023) via WhatsApp groups, "continuous learning resources," "expert guidance," and "peer collaboration." Effective support systems are crucial for sustaining technology integration efforts. Access to ongoing support, whether through formal channels or informal peer networks, can significantly reduce frustration and encourage continued engagement (Fullan, 2016).

Finally, the survey identified several institutional enablers: "management support," "resource allocation," "policy development," and "professional development." These enablers mirror the institutional factors often cited in successful implementations of educational technology. Strong leadership support, adequate resource allocation, clear policies, and opportunities for continuous professional development create an environment conducive to innovation and adoption (Rogers, 2003).

6. Study Limitations

6.1. Scope and Generalizability

Convenience sampling has inherent potential for sampling bias (Sharma, 2017). The participants may not be representative of a wider population, leading to selection bias and limited generalizability (Scribbr, n.d.).

This pilot study constitutes the initial phase of a larger research program. It reports preliminary findings on application of learning and perceived learning gains among participants, with the understanding that more robust inferential analyses will follow as additional data are collected across subsequent phases and analysis performed in the project.

6.2. Data or Methodological Constraints

The survey was distributed to 283 participants across two groups, with 73 completing the survey, yielding a 25.8% response rate. This falls considerably below recommended thresholds where rates above 50% are considered desirable and 80% or higher are regarded as excellent (Dillman et al., 2014; Groves et al., 2004). The low response rate raises concerns about non-response bias and generalizability.

7. Recommendations and Conclusions

The findings lead to clear recommendations for facilitating AI adoption in education, categorized into immediate actions, long-term strategies, and support mechanisms.

Immediate Actions must address the most pressing technical, policy, and access barriers to lay a foundation for comprehensive AI integration. Infrastructure investment by providing reliable internet and computer access is paramount, as many educators struggle with poor connectivity and inadequate technology resources. Policy development, including the creation of clear AI usage guidelines and regulations, represents an urgent institutional need that has emerged consistently across responses. Basic training programs that focus on fundamental prompt engineering skills can provide an immediate boost to educators' confidence and capability, addressing the widespread need for practical competencies. Additionally, tool accessibility can be enhanced by providing access to premium AI tools, where possible, unlocking advanced functionalities that many educators currently cannot utilize due to cost constraints.

Long-term Strategies focus on sustained growth and systemic integration, ensuring AI becomes an integral part of the educational ecosystem. Continuous professional development through regular updates and advanced training will be essential to keep pace with rapid AI advancements and evolving educational applications. Community building by maintaining support networks for ongoing learning will foster collaboration and knowledge sharing among educators, leveraging the peer learning success factor identified in the analysis. Integration planning requires a systematic approach to incorporating AI into curricula rather than ad hoc adoption, ensuring comprehensive and purposeful implementation. Resource sharing through collaborative platforms for sharing AI-generated materials can reduce individual workload while promoting best practices and collective innovation.

Support Mechanisms are vital for ensuring educators feel supported and empowered throughout their AI integration journey. Technical support through a help desk for AI tool troubleshooting can address immediate technical issues that often frustrate users and impede adoption. Mentorship programs that pair experienced users with beginners can provide personalized guidance and support, capitalizing on the collaborative learning approaches that have proven successful. Regular workshops offering hands-on sessions for skill development are crucial for building practical proficiency and confidence in AI tool usage. Finally, resource libraries serving as accessible repositories of AI tools and guides can provide valuable learning resources that educators can reference as needed throughout their professional development journey.

In conclusion, these recommendations provide a strategic roadmap for accelerating AI adoption in education by addressing immediate barriers, building long-term capacity, and reinforcing educator support. By prioritizing foundational infrastructure, establishing clear policies, and offering basic training, institutions can catalyze initial momentum. Sustained professional development, intentional curriculum integration, and peer collaboration will embed AI more deeply into educational practice. Ongoing technical support, mentorship, and access to curated resources will ensure educators are not only equipped but also empowered to navigate the evolving AI landscape with confidence and competence.

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