

ARTIFICIAL INTELLIGENCE

Generative AI in Distance Education: A Human-in-the-Loop Framework for Personalisation, Inclusion and Academic Integrity

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Abstract

Generative Artificial Intelligence (GenAI) is creating new possibilities for distance education through conversational learning support, personalised explanations, automated feedback and multilingual assistance. However, its integration also raises concerns regarding academic integrity, unequal access, information reliability, learner autonomy and data privacy. This paper develops a conceptual framework for integrating GenAI into distance education through a human-in-the-loop approach. Drawing on relevant scholarly literature and international educational policy documents, the study examines the relationship between AI-supported personalisation, inclusive learning, human oversight and academic accountability. It proposes an integrated framework in which teachers and learners retain meaningful decision-making authority while AI provides supplementary educational support. The framework comprises five dimensions: human agency, equitable access, learner-centred personalisation, academic integrity and responsible data governance. The paper argues that technological availability alone cannot guarantee educational improvement; effective implementation also requires AI literacy, appropriate assessment practices, institutional policies and continuous human evaluation. The proposed framework offers conceptual guidance for higher-education institutions seeking to adopt GenAI responsibly in distance-learning environments. As a conceptual contribution, it requires subsequent empirical evaluation to establish its applicability across different educational contexts.

Keywords: generative artificial intelligence; distance education; human-in-the-loop; personalised learning; inclusive education; academic integrity; AI ethics

1 Introduction

Distance education has expanded educational opportunities by enabling learners to study beyond the physical boundaries of conventional classrooms. Digital learning platforms provide access to instructional materials, recorded lectures, online assessments and virtual communication. Nevertheless, challenges remain, particularly concerning individual academic support, learner engagement, timely feedback and equitable access to educational resources.

Generative Artificial Intelligence (GenAI) introduces a new dimension to this environment. Unlike digital platforms that primarily distribute predetermined materials, GenAI systems can generate explanations, examples, questions and feedback in response to learners' requests. These capabilities may support independent learning and provide additional assistance to students who require alternative explanations or flexible study arrangements.

The potential benefits, however, must be considered alongside significant limitations. AI-generated responses may contain inaccuracies, reproduce biases or encourage excessive dependence on

automated assistance. Unequal access to reliable connectivity, appropriate devices and AI literacy may also prevent learners from benefiting equally. UNESCO's guidance on GenAI consequently emphasises human agency, privacy, equity and appropriate pedagogical design as important considerations in educational adoption (Miao and Holmes, 2023).

These concerns suggest that the central issue is not simply whether GenAI should be introduced into distance education, but how it should be integrated without weakening the human and ethical foundations of learning.

The present paper addresses this issue through a human-in-the-loop approach. In this approach, AI provides supplementary educational assistance, while teachers and learners retain responsibility for evaluating information, making educational decisions and demonstrating authentic learning. The paper develops a conceptual framework intended to connect personalisation and inclusion with academic integrity and responsible governance.

2 Problem statement

The increasing availability of GenAI creates a tension between educational opportunity and educational responsibility. On one hand, conversational systems can provide flexible explanations, language assistance and immediate practice opportunities. On the other hand, unrestricted or poorly governed use may compromise independent thinking, assessment reliability and the protection of learner information.

A further concern is that technological personalisation does not necessarily produce educational inclusion. Students with limited internet access, insufficient digital skills or inadequate technological resources may be disadvantaged even when AI-supported learning tools are available.

Existing educational discussions provide important insights into individual aspects of GenAI, including personalised learning, teacher support, academic integrity and ethical governance. However, institutions also need an integrated approach that connects these dimensions when designing distance-learning practices.

The research problem addressed in this paper is therefore the need for a coherent, human-centred framework that explains how GenAI can support personalised and inclusive distance education while preserving learner responsibility, teacher oversight and academic integrity.

3 Review of related literature

Research on artificial intelligence in education predates the emergence of contemporary GenAI systems. Zawacki-Richter et al. (2019) reviewed AI applications in higher education and identified areas such as profiling, prediction, assessment and adaptive systems. Their review also drew attention to the need for greater consideration of pedagogical and educator perspectives.

Subsequent developments in large language models have broadened the discussion. Kasneci et al. (2023) examined the opportunities and challenges associated with language models in education, including personalised assistance, feedback and the risks of inaccurate outputs. Lo (2023), through a rapid review of ChatGPT-related educational literature, similarly highlighted both potential applications and concerns requiring further investigation.

Personalisation is particularly relevant to distance education because learners frequently study with varying levels of prior knowledge and receive different amounts of direct teacher support. GenAI may

provide alternative explanations and practice activities, although its usefulness depends on output reliability and appropriate instructional design.

Academic integrity represents another major strand of the literature. Cotton et al. (2024) discussed the implications of ChatGPT for academic integrity and the need for educational responses that go beyond traditional assumptions about assessment. This debate supports the reconsideration of assignments and examinations so that learners' reasoning, understanding and individual contributions remain demonstrable.

International policy literature also stresses responsible adoption. UNESCO's guidance identifies privacy, equity, human agency and pedagogical validation as important considerations in the use of GenAI (Miao and Holmes, 2023). Its AI competency frameworks for teachers and students further emphasise the development of relevant knowledge, ethical awareness and critical capabilities.

Taken together, the literature establishes that GenAI should be examined neither exclusively as an educational opportunity nor solely as a threat. Its value depends on how technological capabilities are integrated with pedagogical objectives, human judgement and institutional safeguards.

4 Research gap

The literature provides substantial discussion of AI-supported learning, personalised assistance, academic integrity and ethical implementation. Nevertheless, a practical conceptual challenge remains: how can these concerns be incorporated into one coherent model specifically intended to guide the responsible use of GenAI in distance education?

Three interconnected issues motivate the present study. First, personalised learning must be considered alongside equitable access because learners do not possess equal technological resources or digital competencies. Second, AI-supported learning requires clear boundaries between supplementary assistance and the replacement of independent student work. Third, human oversight must be integrated into educational design rather than treated as a corrective measure introduced only after problems arise.

The paper addresses this conceptual gap by proposing a human-in-the-loop framework that connects five dimensions: human agency, equitable access, learner-centred personalisation, academic integrity and responsible data governance.

The proposed framework is a conceptual synthesis, not a claim that these five dimensions have already been empirically validated as a complete model. Its contribution lies in organising these interdependent concerns into a structure that can subsequently be examined through expert evaluation and empirical research.

5 Research objectives

The primary objective of this study is to develop a human-in-the-loop framework for the responsible integration of Generative Artificial Intelligence (GenAI) into distance education. The framework aims to balance the benefits of AI-supported learning with the need to preserve human judgement, learner autonomy, educational equity and academic integrity.

The specific objectives of the study are as follows:

1. To examine the potential of Generative Artificial Intelligence to support personalised learning in distance education.
2. To analyse how GenAI can improve accessibility, flexibility and inclusion for learners from diverse educational, linguistic and socioeconomic backgrounds.
3. To identify the ethical, pedagogical and academic challenges associated with the use of GenAI in distance-learning environments.
4. To propose a human-in-the-loop framework that integrates personalisation, inclusion, academic integrity, human oversight and responsible data governance.
5. To recommend institutional strategies for the effective and ethical implementation of GenAI in distance education.

6 Research questions

The study addresses the following research questions:

RQ1: How can Generative Artificial Intelligence support personalised learning in distance education while preserving learner autonomy?

RQ2: How can GenAI contribute to accessible and inclusive distance-learning experiences for learners with diverse educational needs?

RQ3: What challenges does GenAI create for academic integrity, information reliability, data privacy and independent learning?

RQ4: How can meaningful human oversight be incorporated into GenAI-supported teaching, learning and assessment?

RQ5: What institutional policies and practices are required to ensure the responsible and equitable integration of GenAI into distance education?

These research questions guide the conceptual analysis and the development of the proposed framework. They are addressed through a synthesis and interpretation of relevant literature rather than through original survey or experimental data.

7 Research methodology

7.1 Research design

The study adopts a conceptual and analytical research design to examine the opportunities and challenges associated with Generative Artificial Intelligence in distance education. The principal purpose is to develop an integrated framework that connects AI-supported personalisation and inclusion with human oversight, academic integrity and responsible data governance.

A conceptual research design is appropriate because the study seeks to organise existing knowledge, identify relationships between major themes and develop a theoretically informed framework for educational practice. It does not attempt to measure the statistical effect of GenAI on student achievement or establish causal relationships between AI use and learning outcomes.

The analysis draws on scholarly literature concerning artificial intelligence in higher education, large language models, academic integrity and responsible AI implementation. Relevant publications include Zawacki-Richter et al. (2019), Kasneci et al. (2023), Lo (2023), Cotton et al. (2024), and Miao and Holmes (2023).

7.2 Sources of information

The study uses secondary sources, including peer-reviewed journal articles, scholarly reviews and international educational policy guidance. These sources provide the conceptual foundation for examining the educational benefits, limitations and ethical implications of GenAI.

The selected literature is considered in relation to four broad themes:

1. Personalised learning: AI-assisted explanations, practice activities, feedback and flexible learning support.
2. Inclusive education: language assistance, accessibility, diverse learner needs and inequalities in technological access.
3. Academic integrity: authorship, independent thinking, acceptable AI assistance and assessment design.
4. Responsible AI governance: privacy, transparency, accountability and human supervision.

The literature is interpreted thematically to identify common concerns, complementary perspectives and unresolved tensions relevant to distance education.

This study should be understood as a conceptual synthesis, not as a systematic literature review. No claim is made that an exhaustive database search, formal screening process or PRISMA-based review has been completed.

7.3 Analytical procedure

The analysis follows four stages.

Stage 1: Identification of opportunities and challenges. Relevant literature is examined to identify the educational functions of GenAI and the concerns associated with its use.

Stage 2: Thematic categorisation. The identified issues are organised into educational, ethical and institutional themes, including personalisation, inclusion, human agency, academic integrity and data governance.

Stage 3: Conceptual integration. The themes are connected to examine how one dimension may influence or constrain another. For example, personalised learning may improve flexibility, but unequal access can prevent some learners from benefiting equally.

Stage 4: Framework development. The relationships between the themes are organised into a five-dimensional human-in-the-loop framework intended to guide the responsible use of GenAI in distance education.

7.4 Criteria for conceptual evaluation

The proposed framework is assessed against five conceptual criteria:

- **Conceptual clarity:** Whether the dimensions have clearly defined purposes.

- **Internal coherence:** Whether the dimensions complement one another and collectively address the research problem.
- **Literature alignment:** Whether the framework reflects concerns and opportunities identified in relevant scholarship.
- **Practical applicability:** Whether its principles can be translated into institutional policies and teaching practices.
- **Ethical adequacy:** Whether it addresses human agency, fairness, privacy, transparency and academic accountability.

These criteria provide a basis for structured conceptual appraisal. However, the framework has not yet undergone independent expert validation or empirical testing. Its effectiveness must therefore be investigated in future research involving educators, learners and distance-learning institutions.

8 Proposed Human-in-the-Loop Framework for distance education

8.1 Concept and rationale

The proposed Human-in-the-Loop Framework positions Generative Artificial Intelligence as a supportive educational resource operating under meaningful human supervision. The framework recognises that GenAI can generate explanations, provide practice questions, support language development and assist with preliminary feedback. Nevertheless, educational decisions, academic judgement and responsibility for learning outcomes should not be delegated entirely to AI systems.

The framework is based on the principle that AI should enhance human teaching and learning rather than replace the intellectual and ethical responsibilities of teachers and learners.

For example, a distance learner studying a difficult academic concept may use a GenAI tool to obtain a simplified explanation, request examples and practise through additional questions. The learner must still evaluate the information, consult reliable course materials and demonstrate independent understanding. The teacher remains responsible for clarifying misconceptions, evaluating achievement and ensuring that learning activities meet the prescribed educational objectives.

The proposed framework consists of five interconnected dimensions: human agency and pedagogical oversight, equitable access and inclusive learning, learner-centred personalisation, academic integrity and intellectual accountability, and responsible data governance and transparency.

8.2 Dimension one: Human agency and pedagogical oversight

Human agency refers to the capacity of learners and educators to exercise informed judgement and retain meaningful control over educational decisions. In a human-in-the-loop model, GenAI supports educational activities while teachers retain responsibility for instructional design, academic evaluation and pedagogical guidance.

AI-generated explanations and feedback can be useful, but they may contain factual inaccuracies, misleading interpretations or incomplete reasoning. Consequently, AI-generated information should be evaluated in relation to learning objectives and reliable educational resources.

Teachers should establish appropriate rules for AI use, review important instructional materials and intervene when AI-generated outputs are inaccurate or unsuitable. Learners should be encouraged to question AI responses, verify information and seek human guidance when necessary.

The level of human oversight should correspond to the significance of the educational decision. For example, AI-generated practice questions may require routine review, whereas decisions affecting grades, academic progression or access to learning opportunities require stronger human involvement.

This dimension emphasises that teachers are not merely monitors of technological systems. They remain essential providers of academic judgement, motivation, contextual understanding and intellectual guidance.

8.3 Dimension two: Equitable access and inclusive learning

One potential advantage of GenAI is its capacity to provide flexible assistance to learners with different educational backgrounds, language abilities and learning requirements. AI-supported translation, simplified explanations, alternative examples and language assistance may help learners engage with course materials more effectively.

For instance, a learner studying through distance education may use an AI tool to clarify unfamiliar terminology or obtain an explanation of a difficult topic before consulting the prescribed textbook. Learners who require additional language support may benefit from examples and explanations adapted to their level of understanding.

However, these benefits are not automatically available to everyone. Differences in internet connectivity, device availability, digital literacy and access to paid AI services can create inequalities. AI systems may also provide less reliable or less culturally appropriate responses for certain languages and communities.

Educational institutions should therefore provide accessible course materials, low-bandwidth alternatives, appropriate language support and guidance for learners with varying levels of digital competence. Essential learning outcomes should not depend on access to a particular paid AI platform unless equitable access arrangements are in place.

Inclusivity also requires the evaluation of AI-generated content for accuracy, relevance, accessibility and cultural appropriateness. The purpose should be to reduce educational barriers rather than reproduce existing inequalities through new technologies.

8.4 Dimension three: Learner-centred personalisation

Personalised learning involves adapting educational support to learners' needs, prior knowledge, learning pace and areas of difficulty. In distance education, where direct interaction with teachers may be limited, GenAI can offer additional opportunities for explanation and practice.

Learners may request step-by-step explanations, practical examples, summaries, revision questions or alternative descriptions of difficult concepts. Such support can allow learners to revisit material at their own pace and address particular learning difficulties outside scheduled teaching hours.

Nevertheless, personalisation has limitations. An AI system may misunderstand a question, generate incorrect information or provide an explanation that reinforces an existing misconception. Learners may also become dependent on simplified responses without developing the critical thinking required for independent academic work.

The proposed framework therefore treats AI-generated personalisation as supplementary and provisional. Learners should verify explanations against course materials and complete activities that

require independent reasoning. Teachers should identify when additional instruction or intervention is needed.

Effective personalisation should strengthen learner autonomy rather than encourage passive acceptance of AI-generated answers. Its ultimate purpose is to help learners become more confident, reflective and independent participants in their education.

8.5 Dimension four: Academic integrity and intellectual accountability

Academic integrity is a major concern in GenAI-supported distance education because students frequently complete assignments, projects and assessments without continuous direct supervision. Generative systems can support brainstorming, language improvement and feedback, but they can also be used to produce work that learners submit without adequate understanding or acknowledgment.

The educational challenge is to distinguish legitimate assistance from uses that misrepresent authorship or undermine the intended learning outcomes.

Institutions should establish clear, assessment-specific rules. For example, an assignment may permit AI-assisted brainstorming and grammar correction while requiring the student to develop the argument, verify the evidence and produce the final analysis independently. Other assessments may restrict AI use where independent performance is central to the learning objective.

Where institutional policy requires disclosure, students should explain how AI contributed to their work. They remain responsible for checking factual claims, verifying references and ensuring that their submissions comply with academic standards.

Assessment practices can also be strengthened through oral presentations, reflective commentaries, supervised activities, staged assignments and project-based evaluation. These approaches can provide additional evidence of learners' understanding when appropriately aligned with course objectives.

AI-detection tools should not be treated as conclusive evidence of misconduct. Their results require cautious interpretation and should not replace fair institutional procedures or the opportunity for students to explain their work.

Academic integrity is best supported through a combination of clear expectations, meaningful assessment, AI literacy and learner accountability.

8.6 Dimension five: Responsible data governance and transparency

The use of AI in distance education may involve personal information, assignment drafts, educational records and conversational data. Depending on the platform and its settings, information submitted to an AI system may be stored or processed in ways that learners do not fully understand.

Educational institutions should therefore evaluate privacy and security before adopting AI tools. Important considerations include the information collected, retention periods, access permissions, data-processing arrangements and compliance with applicable legal and institutional requirements.

Students and teachers should receive clear guidance about the information they may safely enter into AI applications. They should avoid sharing unnecessary personal information, confidential institutional material or identifiable information about other individuals through unapproved systems.

Transparency also involves explaining how AI is used in teaching, feedback and assessment. Where AI contributes to consequential decisions, institutions should establish appropriate human review, accountability mechanisms and procedures for correcting errors.

Learners should have a reasonable opportunity to question decisions that affect their academic progress and to seek clarification when AI-generated information is inaccurate or inappropriate.

This dimension places responsibility for privacy and transparency on institutions as well as individual users. Responsible adoption requires clear policies, suitable technical safeguards and continuing review.

9 Analytical discussion

The five dimensions of the proposed framework are interconnected and should not be implemented in isolation. Personalisation without equitable access may disproportionately benefit learners who already have better technological resources. Inclusion without reliable human oversight may expose learners to inaccurate or culturally inappropriate content. AI assistance without academic-integrity safeguards may weaken independent learning, while inadequate data governance may undermine trust in digital education.

The framework therefore challenges the assumption that simply introducing GenAI into distance education will necessarily improve learning outcomes.

9.1 Balancing personalisation and learner autonomy

GenAI can provide immediate explanations and flexible learning support, but convenience alone does not establish educational effectiveness. Learners must still engage in critical thinking, information verification and independent problem-solving.

The framework proposes that personalisation should be used to strengthen understanding rather than eliminate intellectual effort. AI may help learners identify alternative explanations or practise a concept, while teachers and learners remain responsible for evaluating whether genuine understanding has developed.

9.2 Integrating inclusion with educational equity

AI-supported translation, simplified explanations and flexible assistance may reduce some barriers to participation. However, unequal internet access, differences in digital literacy and variations in AI performance can limit these benefits.

Consequently, inclusion should be evaluated in terms of meaningful participation, not merely technological availability. Institutions should consider whether learners from different backgrounds can access and use AI-supported resources fairly.

9.3 Protecting academic integrity through assessment design

The availability of GenAI requires educators to reconsider how learning is demonstrated and evaluated. Policies should clarify acceptable forms of assistance, while assessments should provide opportunities for learners to demonstrate their own understanding.

The framework does not assume that all AI use is misconduct. Instead, it emphasises the relationship between permitted assistance, the learning objective, transparent disclosure and the learner's responsibility for the submitted work.

9.4 Making human oversight meaningful

Human involvement is effective only when educators have the knowledge, authority and opportunity to evaluate AI-generated information. Supervision should not be a merely symbolic step in which teachers are expected to accept automated outputs without scrutiny.

Institutions should support educators through professional development, appropriate guidance and procedures for reviewing errors or challenging consequential AI-supported decisions.

9.5 Strengthening institutional accountability

Responsible GenAI adoption is not solely an individual learner's responsibility. Institutions must address data protection, accessibility, staff preparation, procurement and acceptable-use policies.

A sustainable approach requires periodic review because AI applications, educational practices and associated risks may change over time. Institutional policies should be updated in response to emerging evidence and feedback from learners and educators.

Overall, the proposed framework presents GenAI integration as a combined pedagogical, ethical and institutional responsibility. Its central proposition is that the educational value of GenAI depends not only on its technical capabilities but also on the quality of human oversight, equitable access, assessment practices and governance surrounding its use.

The framework offers a conceptual basis for future research and institutional planning. However, its practical effectiveness and applicability across different educational contexts require empirical investigation.

10 Implications of the proposed framework

The proposed Human-in-the-Loop Framework has significant implications for teaching and learning, inclusive education, institutional governance and future research. It suggests that the responsible integration of Generative Artificial Intelligence (GenAI) into distance education requires more than technological availability. It demands a coordinated approach that combines AI-supported learning with human judgement, learner autonomy, equitable access and academic accountability.

10.1 Implications for teaching and learning

The framework encourages educators to use GenAI as a supplementary teaching resource rather than a substitute for pedagogical expertise. AI tools may assist in generating examples, simplifying complex concepts, developing practice questions and providing preliminary feedback. However, teachers remain responsible for verifying the accuracy of educational content, aligning activities with learning outcomes and identifying learners who require additional support.

For learners, the framework emphasises critical thinking, independent reasoning and information verification. Students should recognise that AI-generated responses may contain inaccuracies and should compare important claims with prescribed textbooks, scholarly publications and other reliable sources. Responsible use can support self-directed learning, whereas uncritical dependence may weaken opportunities to develop independent academic skills.

10.2 Implications for inclusive and equitable education

GenAI may support inclusion by providing language assistance, alternative explanations and flexible learning resources. These functions may be particularly valuable in distance education, where learners differ in their linguistic backgrounds, educational preparation and access to direct teacher interaction.

Nevertheless, the benefits of AI are not necessarily distributed equally. Differences in internet connectivity, device availability, digital literacy, disability accessibility and access to paid services may affect learners' ability to use these tools. Institutions should therefore combine AI-supported resources with accessible course materials, alternative learning arrangements and appropriate academic assistance.

The framework also highlights the need to evaluate AI-generated material for linguistic accuracy, cultural relevance and potential bias. Inclusion should be understood as meaningful participation in learning, not simply the availability of a technological platform.

10.3 Implications for institutional governance

Educational institutions need transparent policies governing acceptable AI use, assessment, privacy, accountability and human oversight. These policies should distinguish between different educational activities and clarify when AI assistance is permitted, restricted or required to be disclosed.

Professional development is equally important. Teachers need opportunities to understand the capabilities and limitations of GenAI, evaluate generated information and design assessments that support genuine learning. Institutional policies should be reviewed periodically to respond to technological developments and feedback from educators and learners.

10.4 Implications for future research

The framework provides a basis for future investigations into the relationship between GenAI, learner autonomy, academic integrity and educational inclusion. Researchers could examine its applicability across different disciplines, languages, educational levels and distance-learning models.

Further studies may investigate whether AI-supported personalisation improves learners' understanding, how educators perceive human oversight requirements, and which institutional conditions enable equitable and responsible implementation. Such research would help establish the framework's practical value beyond its present conceptual contribution.

11 Recommendations

Based on the proposed framework and the issues discussed in the preceding sections, the following recommendations are offered for educational institutions, educators, learners and policymakers.

11.1 Establish clear AI-use policies

Institutions should develop written policies that define acceptable and unacceptable uses of GenAI in assignments, examinations, projects and research. The policies should explain disclosure requirements, authorship expectations and students' responsibility for submitted work.

Rules should be communicated clearly and applied consistently. Institutions should avoid relying on blanket permissions or prohibitions without considering the learning objectives of individual assessments.

11.2 Strengthen AI literacy

AI literacy should be incorporated into faculty development and student orientation programmes. Teachers and learners should understand how to formulate useful prompts, evaluate AI-generated responses, verify factual claims, identify possible bias and protect personal information.

Training should also explain that AI-generated references may be inaccurate or nonexistent. Learners should verify bibliographic details and consult the original sources before citing them in academic work.

11.3 Maintain meaningful human oversight

Teachers should retain appropriate authority over instructional design, assessment criteria and consequential academic decisions. AI-generated feedback and recommendations should be reviewed when errors could affect learning outcomes, grades or student progression.

Institutions should establish procedures that allow learners to seek clarification and request human review of important decisions. Human oversight should be supported by adequate training, time and institutional authority rather than treated as a purely formal requirement.

11.4 Promote equitable access and accessibility

Institutions should consider affordability, connectivity, language diversity and accessibility when selecting AI tools. Where feasible, they should provide low-bandwidth alternatives, accessible learning materials and guidance for learners with different levels of digital competence.

Essential learning outcomes should not depend unnecessarily on access to a particular paid AI application. Institutions should also assess whether AI-generated explanations are appropriate for learners from different linguistic and cultural backgrounds.

11.5 Redesign assessment practices

Assessment methods should be aligned with the skills and knowledge students are expected to demonstrate. Depending on the discipline, educators may combine written assignments with oral presentations, reflective commentaries, supervised tasks, practical demonstrations and staged project submissions.

These methods can provide additional evidence of understanding and independent reasoning. They should be selected according to educational objectives rather than used exclusively as a response to concerns about AI misuse.

11.6 Protect privacy and confidential information

Institutions should evaluate the privacy and security practices of AI providers before approving their applications for educational use. Teachers and learners should receive clear guidance about the handling of personal information, student records, unpublished research and confidential institutional material.

Only necessary information should be collected and processed, consistent with applicable legal requirements and institutional policies. Institutions should periodically review data-handling arrangements and communicate relevant changes to users.

11.7 Monitor implementation and evaluate outcomes

Educational institutions should assess the educational value, accessibility and risks of AI-supported learning through pilot projects and periodic reviews. Feedback from students and educators can help identify implementation difficulties and improve institutional practice.

Future evaluations should examine indicators such as learner understanding, satisfaction, accessibility, academic integrity and the workload associated with human oversight. Findings should inform revisions to policies and teaching practices.

12 Limitations of the study

The present study has several limitations that should be considered when interpreting its contribution.

First, the study adopts a conceptual and analytical research design. It does not include original survey data, interviews, classroom observations or experimental findings. Consequently, the proposed framework has not been empirically validated, and the paper cannot establish that its implementation causes improvements in student achievement, retention or educational inclusion.

Second, the study draws on selected scholarly literature and educational policy guidance rather than a formally conducted systematic literature review. Although the selected sources provide a conceptual foundation, the paper does not claim exhaustive coverage of all relevant publications. A future systematic review could extend this work through documented database searches, explicit inclusion and exclusion criteria, and a transparent screening process.

Third, the applicability of the framework may vary across institutions and learner populations. Differences in technological infrastructure, educational resources, course design, language requirements and institutional regulations may influence implementation. The framework may therefore require adaptation for different educational settings.

Fourth, generative AI technologies and their associated policies are evolving rapidly. Changes in system capabilities, accuracy, data practices and educational applications may affect the continued relevance of particular implementation recommendations. Periodic review will be necessary.

Finally, the five dimensions of the framework represent a proposed conceptual synthesis. Their relative importance, completeness and practical effectiveness have not been assessed through independent expert validation or empirical testing. Future research should examine whether the dimensions adequately represent the experiences and needs of educators, learners and institutions.

These limitations define the current scope of the study rather than invalidate its contribution. The framework should be understood as a foundation for further investigation, refinement and practical evaluation.

13 Conclusion

Generative Artificial Intelligence offers important possibilities for distance education through personalised explanations, flexible learning support, language assistance and supplementary feedback. These capabilities may help learners engage with educational material at their own pace and address certain barriers associated with geographically distributed learning. However, technological adoption alone does not guarantee educational improvement.

The use of GenAI also raises concerns about unequal access, inaccurate information, academic integrity, learner dependence and data privacy. Addressing these concerns requires an integrated approach that connects technological capabilities with pedagogical judgement, ethical responsibility and institutional governance.

This paper proposes a Human-in-the-Loop Framework consisting of five interconnected dimensions: human agency and pedagogical oversight, equitable access and inclusive learning, learner-centred personalisation, academic integrity and intellectual accountability, and responsible data governance and transparency. The framework brings these concerns together to provide a conceptual basis for responsible GenAI integration in distance education.

Its central proposition is that AI should enhance educational capability without displacing human responsibility. Personalisation should promote independent understanding, inclusion should be supported through equitable access, and academic integrity should be protected through transparent expectations and appropriate assessment design. At the same time, privacy and accountability should remain continuing institutional responsibilities.

The principal contribution of the study is the integration of educational opportunities and ethical safeguards into a single human-centred framework. It offers conceptual guidance for institutional planning, teacher development and responsible AI adoption. Nevertheless, its practical effectiveness remains to be established.

Future research should seek expert feedback on the framework's clarity and applicability, followed by pilot studies involving teachers and learners across different distance-learning contexts. Empirical investigations could examine the relationship between the framework's dimensions and outcomes such as learner engagement, understanding, accessibility and academic responsibility. Comparative studies across disciplines, languages and institutional settings could further identify necessary adaptations.

In conclusion, the future of GenAI in distance education depends not only on what AI systems can generate but also on how educators, learners and institutions use, evaluate and govern them. A human-in-the-loop approach offers a principled foundation for pursuing personalised, inclusive and academically responsible learning while preserving the central role of human judgement in education.

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