

The Double-Edged Sword: A Systematic Review of AI-Powered Tools for Student Engagement and Personalised Learning in Zambian Higher Education

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ABSTRACT

Background: The widespread adoption of Artificial Intelligence (AI) globally is transforming the higher education sector, and countries such as Zambia are keen to harness its potential. These ambitions are reflected in national policies, such as Zambia's National AI Strategy (2024–2026), which aims to incorporate AI into key sectors, including education, to foster innovation and growth.

Objective: The proposed paper offers a systematic literature review focused on synthesising and critically evaluating the existing evidence on how AI-powered learning tools can be utilised to boost student engagement and personalised learning amongst students in Zambian universities. It aims to map the current landscape and emphasise the tensions between strategic aims and practical realities.

Methodology: A systematic literature review was carried out following PRISMA guidelines. Searches were conducted on Scopus, Web of Science, Google Scholar, ERIC, and regional portals to gather peer-reviewed articles, conference papers, and official reports published between 2018 and 2025. A thematic analysis approach was used to synthesise the data extracted from the selected studies.

Findings: The review offers a dual perspective. On one side, there is widespread awareness and active, student-led use of generative AI tools, motivated by their perceived usefulness and ease of use. The potential of AI to generate personalised, data-driven, and engaging learning experiences is well recognised. On the other side, this potential is significantly limited by systemic barriers. These include the deep digital divide, insufficient digital infrastructure, a lack of institutional policies on ethical use, widespread concerns about academic integrity, and the most critical gap: a lack of AI literacy and training for both faculty and students.

Conclusion: The pathway to harness the transformative power of AI in Zambian higher education is not solely a technological matter but also an ecological one. It necessitates a collective, multi-stakeholder approach to fostering an enabling and ethical environment. There is a need to go beyond merely establishing high-level strategies and ensure that AI is genuinely implemented through targeted investments in infrastructure, the development of effective institutional policies, and the execution of large-scale capacity-building programmes aimed at promoting equitable educational development and preventing the widening of existing inequalities.

Keywords: Artificial Intelligence, Generative AI, Student Engagement, Personalised Learning, Higher Education, Zambia, Systematic Review, Digital Divide, Technology Acceptance Model (TAM).

INTRODUCTION

The Global Transformation of Higher Education by AI

Artificial Intelligence (AI) has ignited a technological revolution in the 21st century, transforming industries, economies, and societies. The fundamental aspect of this transformation is higher education. Universities

worldwide are confronting both the opportunities and challenges presented by AI, especially with the rise of advanced generative AI models such as ChatGPT, Gemini, and others (Mutelo, 2025). These technologies have the potential to revolutionise teaching methods by offering personalised learning pathways, automating administrative tasks, providing intelligent tutoring, and boosting student engagement through interactive and adaptive content (Copperbelt University, 2024). As institutions across the globe experiment with these tools, a new era of education is emerging—more data-driven, personalised, and efficient (Allam et al., 2024).

The Zambian Context: Ambition Meets Reality

In the African context, certain factors influence the adoption of AI in education. Smaller countries like Zambia can harness AI to address many challenges faced by traditional education, such as large classes and limited resources, and to bridge the digital divide (Makers' Muse, 2025). The Zambian government has shown strong interest in digital transformation, recognising its potential. This is clearly reflected in the ambitious National AI Strategy (2024-2026), a plan aimed at boosting the economy and enhancing services for citizens through the strategic use of AI (Nzuki, 2025). The strategy also highlights the importance of developing human capital, seeking to embed AI-related courses and literacy campaigns into the educational system at all levels, including primary and higher education.

Bottom-up enthusiasm enhances this top-down strategic initiative. The Ministry of Education has already begun introducing generative AI tools at universities. It is actively developing a national policy to regulate their use in higher education and Technical and Vocational Education and Training (TVET) institutions (ICU TV Zambia, 2025). This proactive approach makes Zambia one of the first African countries to formally incorporate generative AI into its university programmes, demonstrating a strong commitment to modernising education and preparing future generations for a technological world.

Problem Statement: The Paradox of Potential

The gap between the promise of AI and its fair, ethical, and practical use in Zambian universities remains significant despite high-level strategies and strong student interest. The literature reveals a complex paradox. On one hand, student awareness and adoption are very high. Research at Copperbelt University, however, showed an 88 per cent awareness level and an 82 per cent adoption level of generative AI among students (Chaamwe, 2025). The use of tools like ChatGPT in academic work is actively supported by students due to the perceived benefits in efficiency and access to information (Makanday, 2025).

On the one hand, this uncontrolled, rapid adaptation occurs in a field full of risks. These include the significant digital divide, where only 33% of people are internet users despite high subscription rates, hindered by unstable power supplies and limited access to devices (Mutelo, 2025). Furthermore, there is a serious gap in policy at the institutional level. Most universities lack clear guidelines on the ethical use of AI, leaving both students and lecturers confused about academic integrity, plagiarism, and data privacy (Manchishi, as cited in Makanday, 2025). A shortage of human capital exacerbates this issue, as faculty often lack the necessary training to incorporate AI into their teaching or to guide students on its responsible use (Thelma et al., 2025). This situation creates a double-edged sword: AI is being utilised, but not always in ways that promote deep learning, critical thinking, or fairness.

Research Questions and Aim

To navigate this complex landscape, this review is guided by the following research questions:

1. What does the existing literature reveal about the use and perception of AI-powered tools for personalised learning and student engagement in Zambian higher education?
2. What are the primary benefits and opportunities of AI integration as identified by students, faculty, and policy documents in the Zambian context?
3. What are the main challenges—such as infrastructural, ethical, and pedagogical obstacles—that hinder the effective and equitable integration of AI in Zambian universities?

This paper proposes conducting a systematic literature review to summarise the existing research, identify key themes, and describe the current state of AI in Zambian higher education. The review is limited to universities and will cover literature published from 2018 to the present (August 2025), or the period when generative AI began to surge and Zambia started developing its national strategy. The aim is to assist policymakers, university administrators, and educators in understanding the strategic needs for harnessing AI's potential responsibly by providing a comprehensive overview.

LITERATURE REVIEW (CONCEPTUAL AND THEORETICAL FRAMEWORK)

Before synthesising the findings of this systematic review, it is important to establish the conceptual and theoretical foundations that support the analysis. This section highlights the key concepts underlying the research and presents the theoretical models used to understand technology adoption within the Zambian context.

Defining Core Concepts

Typology of AI-Powered Learning Tools

Artificial intelligence in education is not a single term. The literature on Zambia highlights various categories of AI tools that impact teaching and learning.

Generative AI: Generative AI is the most discussed type of AI in recent literature, defined as the kind that can produce new content (text, images, code) based on user prompts (for example, ChatGPT, Gemini, Poe). In Zambia, learners and researchers are using it to generate research ideas, draft questions, conduct literature searches, and complete assignments (Mutelo, 2025).

Intelligent Tutoring Systems (ITS): These are adaptive systems designed to offer step-by-step, personalised guidance and feedback to students, aiming to simulate the guidance of a human tutor. Their role in enhancing efficiency and accessibility in Zambian higher education has been recognised, but their implementation is less well-documented compared to that of generative AI (Chanda et al., 2025).

AI-Based Writing Assistants: Writing tools like Grammarly, which utilise AI to offer feedback on grammar, style, and clarity, are widely accessible and highly popular. Their usage raises concerns about academic integrity and the development of independent writing skills (Abstract, Exploring the Use of AI-Powered Chatbot).

Data-Driven Analytics Platforms: These platforms gather and analyse data on student performance and interaction to spot patterns, predict at-risk students, and provide insights for educators. This enables early intervention and a clearer understanding of learning (Thelma et al., 2025).

Personalized Learning

Personalised learning customises education to each student's unique needs, strengths, weaknesses, and learning styles. I am a strong supporter of this approach. Using AI algorithms, tutors can analyse extensive student data to adjust the learning pace, recommend related content, and even offer personalised feedback in real-time (Copperbelt University, 2024). In Zambia, personalised learning is seen as an opportunity to cater to the diverse needs of students and improve individual performance; however, its practical implementation depends on overcoming infrastructural and digital literacy challenges (Moono et al., as cited in Thelma et al., 2025).

Student Engagement

- Student engagement is a vital factor in academic success and retention. It is regarded as a multidimensional concept consisting of three main elements:
- Behavioural Engagement: This relates to involvement in academic and co-curricular activities, such as attending classes, completing assignments, and communicating with AI tools.

- Emotional Engagement: Pertains to students' emotional responses to learning, such as interest, motivation, and feeling a sense of belonging to the institution.
- Cognitive Engagement: The mental dedication to the learning process, encompassing critical thinking, problem-solving, and an interest in addressing complex concepts.

Using AI tools can boost engagement by making learning more interactive, giving immediate feedback to keep motivation high, and providing collaborative tools that support learning. However, there are concerns about superficial AI use, which might weaken cognitive engagement through passive, copy-and-paste habits (Makanday, 2025).

Theoretical Underpinnings for AI Adoption

To identify the factors that encourage or restrict the use of AI tools in Zambian universities, the literature frequently relies on established theories of technology adoption. These frameworks provide a valuable approach to analysing the findings of this review.

The most frequently cited framework in the Zambian context is the Technology Acceptance Model (TAM), which was first introduced by Davis in 1986 (Chaamwe, 2025; Mutelo, 2025). TAM proposes that two main beliefs primarily influence a user's intention to adopt new technology.

- Perceived Usefulness (PU): how much an individual believes that using a specific system would enhance their job or academic performance.
- Perceived Ease of Use (PEOU): The degree to which a person believes that using a particular system would be effortless.

These two aspects shape the user's attitude towards the technology, which then impacts their behavioural intention to use it, and ultimately, their actual utilisation.

Other related theories are also evident in the literature. The research at David Livingstone College of Education cites the Unified Theory of Acceptance and Use of Technology (UTAUT) as a guiding framework (Research at Mulungushi University, 2023). Additionally, the Human-Computer Interaction (HCI) theory is employed to frame a study on AI usability, stressing the importance of user-centred design, accessibility, and creating seamless experiences for educators and learners. This is particularly significant in Zambia due to its infrastructural limitations (Thelma et al., 2025). Overall, these theories offer a solid foundation for understanding why students are quickly adopting AI tools, whereas institutions and faculty remain more cautious.

METHODOLOGY

The study used a Systematic Literature Review (SLR) to provide an overview of evidence regarding Artificial Intelligence (AI) in Zambian higher education. The PRISMA framework was employed to guide the SLR process, ensuring transparency, reproducibility, and minimising bias. A comprehensive search strategy was applied across various databases, including Scopus, Web of Science, Google Scholar, ERIC, and African Journals Online (AJOL). The search terms included key concepts such as artificial intelligence, generative AI, ChatGPT, higher education, and Zambia, along with adoption-related terms like student engagement and academic integrity. Additionally, relevant studies were identified through manual snowballing of reference lists.

Eligibility criteria were explicitly defined. The inclusion criteria specified that studies had to be peer-reviewed articles, conference papers, or reports that were official publications, written in English, and focused on AI in Zambian higher education. Regional studies were included if they provided disaggregated data for Zambia. Exclusions applied to literature on non-tertiary education, purely technical AI studies lacking social or pedagogical implications, sources not authored by scholars, and sources without full-text availability. The selection process involved two stages: initial screening of titles and abstracts, followed by final inclusion based on the full text. Information was then extracted using a standardised form that recorded details such as authorship, objectives, methodology, population, AI tools examined, key findings, and policy implications.

A thematic analysis was used in synthesis. Data extracted were coded, grouped into patterns, and refined into themes that reflected overarching insights across the studies. This structured approach enabled the review to identify key advantages, drawbacks, adoption patterns, and policy implications of AI integration in Zambian higher education. The final findings stem from a thorough and systematic evaluation of the available literature, ensuring depth and contextual relevance.

RESULTS AND DISCUSSION

The thematic analysis of the selected literature identified four key themes that describe the current state of AI in Zambian higher education. These themes highlight the dynamic interaction between student-led adoption, the recognised potential of AI, the substantial systemic barriers, and the emerging policy responses. This section presents the findings for each theme and examines their implications, linking them to the theoretical frameworks introduced earlier.

Theme 1: The Landscape of AI Awareness and Adoption: A Student-Led Phenomenon

Results

One consistent finding in the literature is the very high rate of awareness and utilisation of AI tools, especially generative AI, among university students in Zambia. A landmark study by Chaamwe (2025), conducted at Copperbelt University, presents some striking quantitative data, showing that 88 per cent of students were familiar with generative AI and 82 per cent had incorporated it into their learning activities. The study also reported relatively frequent use, with half of the students regularly engaging with these tools. This is supported by qualitative reports where students openly acknowledge employing a range of AI applications, including ChatGPT and Nova, to complete assignments with tight deadlines and to generate ideas (Makanday, 2025). Similar patterns are evident among medical students at the University of Zambia, with 90.1 per cent having used AI in various fields and 93.1 per cent recognising its usefulness in simplifying tasks (Mudenda et al., 2025). Comparable studies in South Africa and Kenya also show that over 80 per cent of students are experimenting with generative AI, indicating that Zambia's experience reflects a broader regional trend while still confronting specific local challenges.

In stark contrast, the awareness among faculty and institutions, as well as their systematic adoption of AI, seems to be lagging. Although lecturers such as Kamufisa Manchishi of Mulungushi University recognise the potential of AI in generating additional teaching content, they also express uncertainties and mention the lack of institutional tools to detect AI-generated work beyond a basic plagiarism detector (Makanday, 2025). According to a study by Chanda et al. (2025), while a considerable percentage of educators show moderate awareness, a significant gap exists in the practical use of AI, mainly due to uneven institutional support and a lack of technical skills. Similar gaps between student and faculty adoption have been observed in Nigeria, highlighting that Zambia's institutional lag is part of a broader challenge in sub-Saharan Africa. University students in Zambia are increasingly adopting digital tools, including AI, for their academic work.

Discussion

The Technology Acceptance Model (TAM) can effectively analyse this student-led adoption phenomenon. Generative AI is highly beneficial in the eyes of students; it can quickly address their research, writing, and assignment tasks, directly enhancing their perceived academic performance and efficiency. Meanwhile, the Perceived Ease of Use (PEOU) remains high because conversational interfaces, such as ChatGPT, are user-friendly and require minimal technical knowledge. TAM predicts that a positive attitude and strong behavioural intention towards using the technology will lead to an 82 per cent adoption rate (Chaamwe, 2025).

Conversely, the faculty are less inclined to adopt due to a different assessment of PU and PEOU. Among educators, the perceived usefulness remains uncertain. They see potential, but this is countered by concerns over academic integrity and the effort required to redesign curricula and assessments. The perceived ease of use is also reduced, as effectively integrating AI into pedagogy requires significant time, training, and institutional support, which is reportedly lacking (Thelma et al., 2025). This disconnect between student and

faculty adoption creates considerable tension within institutions, where technology is extensively used but not fully integrated or officially incorporated into the learning process.

Theme 2: The Potential of AI for Personalised Learning and Student Engagement

Results

The literature widely recognises the transformative potential of AI in improving essential educational functions. One key advantage is personalised learning. AI algorithms can analyse patterns in student performance to tailor learning content, adapt to individual learning styles, and provide specific feedback, thereby maximising individual achievement (Thelma et al., 2025; Copperbelt University, 2024). This approach is viewed as especially promising in the Zambian context as a means to address the diverse needs of students in large classes.

Next to personalisation, increased student engagement is a key benefit. Students tend to become active learners when AI tools make their learning process more interactive, provide real-time feedback, and offer tailored content. It is believed that this greater participation not only boosts academic performance but also helps develop critical digital skills crucial for the current Labour market (Mumbi & Nyirenda, 2024, as cited in Thelma et al., 2025). Other documented advantages include automating administrative processes, which frees up educators' time, and enabling data-driven insights to support institutional improvement. Thelma et al. (2025) surveyed participants about their perceptions of AI's usability in various functions, revealing a clear hierarchy of the roles AI can serve. They also gathered information on the practical implementation and usability of AI in Zambian higher education institutions.

Discussion

The potential benefits are obvious, but the literature shows a significant contradiction. Students also use tools meant to boost cognitive engagement in ways that promote passive thinking. An interviewee for a report apparently expressed the opinion that AI encourages laziness among students, as they are simply copying and pasting AI-generated work (Makanday, 2025). This matches findings from Uganda, where students noted similar risks of dependence, indicating that the misuse of copy-and-paste is not unique to Zambia.

To tackle this, institutions should redesign assessments to reduce opportunities for plagiarism by requiring oral defence of written work, structured group problem-solving tasks, and projects that utilise AI as a tool for analysis rather than as a replacement for reasoning.

This incident highlights the double-edged nature of AI. The technology's effectiveness relies on the pedagogical framework in which it is utilised, rather than on its inherent capabilities.

Their dependence on AI as a crutch arises from a lack of guidance on its essential and ethical application. This compromises the fundamental purpose of higher education: to nurture independent, critical thinkers. The challenge faced by Zambian universities is not just access to AI, but creating a culture of AI literacy, where students and staff alike learn how to utilise AI to support rather than replace human intelligence.

Theme 3: Critical Barriers to Effective and Equitable Integration

Results

The literature clearly indicates that several major obstacles obstruct the responsible and equitable integration of AI into Zambian higher education. These can be grouped into three primary areas.

1. **Infrastructural Gaps and Digital Divide:** The main challenge is the absence of dependable digital infrastructure. Although official data indicated that internet penetration reached 64.1 per cent in terms of subscriptions by late 2023, the actual usage rate was significantly lower, at around 33 per cent in early 2025 (Mutelo, 2025). This disparity underscores a notable digital divide, with urban areas having better access to digital resources than rural students, lecturers, and researchers. This inequality is worsened by unreliable power supplies, limited internet bandwidth, and restricted access to computers and digital devices.

2. Policy and Ethical Vacuum: A recurring theme highlights the lack of concrete policies and guidelines at an institutional level. According to lecturers, it is difficult to penalise students for AI misuse because most institutions do not yet have policies specifically addressing the issue (Makanday, 2025). This policy vacuum creates uncertainty and potential risks. The primary ethical issues involve

- Academic Integrity: Widespread misuse of AI to complete copy-and-paste assignments, resulting in plagiarism and a decline in the development of critical thinking skills.
- Data Privacy and Security: The gathering and utilisation of student data by AI platforms continues to be a concern.
- Algorithmic bias: The risk that AI tools, trained on biased data, will reproduce or even amplify disparities.

3. Human Capital Gaps: There is a notable lack of AI literacy and training for both teachers and students. According to research by Chanda et al. (2025), the use of AI is heavily limited by poor infrastructure, insufficient technical expertise, and inconsistent institutional support. Mutelo (2025) also highlights the shortage of adequate training sessions, workshops, and seminars focused on the effective use of AI in research. Without targeted capacity-building initiatives, educators lack the necessary tools to modify their teaching methods or guide students in using AI ethically, and students lack the vital skills needed to assess AI-generated information.

Discussion

All these barriers build up into a major obstacle to realising the potential of AI. The digital divide remains a key issue that undermines AI's power to improve access and fairness; instead, it can create a two-tier educational system where only those with consistent access can benefit. This inequality is especially gendered, with female students in rural areas reporting less access to devices and the internet compared to their male peers, reinforcing socio-economic gaps in higher education. Such a policy gap fosters a culture of misuse and uncertainty, hampering responsible innovation and putting both students and staff in an unclear ethical position. The human capital gap ensures that even where access exists, the technology may only be used superficially. This combination of three issues shows that simply deploying technology is not enough. The solution must be a comprehensive, ecosystem-level approach that addresses infrastructure, policy, and people, and must avoid working in isolation. Tackling these inequalities requires policies that explicitly address gender, socio-economic background, and rural-urban divides, ensuring no group is left behind.

Theme 4: National and Institutional Responses: Bridging the Policy Gap

Results

To address such challenges, Zambia adopts an active, top-down approach to governance. The National AI Strategy (2024-2026), launched in late 2024, serves as the foundation of this effort. It is a comprehensive framework built around six key pillars that will help create a favourable environment for AI development (Nzuki, 2025). The most relevant pillars concerning education are:

- Policy and Regulation: Aiming to establish a robust regulatory framework and create a National AI Council to oversee it, working in collaboration with organisations such as ZICTA.
- Human Capital Development: Enhances the growth of AI skills by incorporating AI courses into the education system and launching AI literacy campaigns.
- Infrastructure and Data Ecosystems: Emphasises investments in broadband connectivity, cloud computing, and data repositories to establish the foundational framework for AI adoption.

This national strategy is being translated into sector-specific actions. In July 2025, the Ministry of Education hosted a National Workshop on Drafting a Generative AI in Education Policy at Mulungushi University. The workshop aimed to lay the foundation for the first national policy on the use of generative AI in higher education and TVET institutions in Zambia, recognising that AI tools are evolving faster than education and institutional policies and preparedness (ICU TV Zambia, 2025). In this effort, international partners such as UNESCO-ICHEI will participate in shaping the policy (XJTLU News, 2025).

Discussion

The national response in Zambia is a commendable effort to tackle the identified barriers at the national level under Theme 3. The National AI Strategy offers clear guidance, and the emphasis on educational policy shows an understanding of the need to develop a dedicated policy. Such a top-down approach is vital for setting standards, guiding investments, and aligning with national development goals.

The effectiveness of these strategies, however, will depend on their implementation at the institutional level. The challenge lies in translating broad national policies into specific, actionable instructions for individual universities. This requires close cooperation between the government, regulatory bodies, and universities. Universities should prepare to accommodate tech-savvy students by developing their own policies and capacities, as noted by education experts like George Hamusunga of ZANEC (Makanday, 2025). The ongoing issue remains the rapid evolution of technology compared to the pace of policymaking. The success of Zambia's response will depend on creating a responsive governance framework that adapts to the changing landscape of AI and promotes responsible innovation on the ground.

CONCLUSION

Summary of Findings

This systematic literature review explores the intricate realm of artificial intelligence in Zambian higher education. The findings highlight a notable divide. On one side, there is a student-driven increase in the use of AI tools, seen as highly useful, easy to use, and with the potential to transform learning through personalisation and greater engagement. On the other side, this opportunity faces a triple systemic bottleneck: a persistent digital gap and infrastructural vulnerabilities, a significant lack of institutional policies and ethical guidelines, and a notable delay in AI literacy among faculty and students. Zambia's proactive national strategy and policy initiatives are a crucial top-down response; however, a substantial gap remains between the country's ambitions and institutional realities. Comparisons with other African nations show that, although Zambia encounters challenges in infrastructure, policy, and skills gaps, its proactive national strategy could position it as a leader in AI integration if effectively executed. To support this, the conclusion proposes a phased roadmap. Phase 1 should focus on developing digital infrastructure and ensuring equitable access. Phase 2 should aim to establish institutional policies, ethical frameworks, and gender-sensitive guidelines that foster a culture of respect and equality. Phase 3 should prioritise capacity-building through AI literacy programmes for faculty and students. Lastly, Phase 4 should advocate for curriculum and assessment reforms that view AI as a tool for creativity and critical thinking, rather than mere replication. This phased plan offers policymakers, institutions, and faculty clear steps to align Zambia's higher education system with the evolving global AI landscape. The conclusion is that AI in Zambia presents a double-edged sword: a tool of immense potential, whose impact is increasingly shaped by the challenging ecosystem rather than the technology itself.

Implications for Stakeholders

The results of this review have important implications for key stakeholders:

- To policymakers: The National AI Strategy offers a strong foundation. The next vital step is to speed up the creation of a specific regulatory framework for education. This framework should be adaptable, providing clear guidance on ethics, data privacy, and academic integrity, while also adjusting to keep up with new technologies. Investment should prioritise closing the digital divide to ensure fair access. In terms of university leadership, there is a pressing need to take a more proactive stance.
- University administrators should also establish clear institutional policies on the acceptable and ethical use of AI. This involves investing in high-quality digital infrastructure, obtaining institutional licences for AI tools to safeguard data security, and, most importantly, implementing ongoing professional development and training programmes for staff.
- To the Educators: A fundamental change in pedagogy is necessary. Instead of trying to ban AI, which is ineffective, educators should focus on teaching students to use these tools critically, ethically, and efficiently. This involves redesigning assessments to emphasise critical thinking, creativity, and real-

world application over memorisation, and teaching AI literacy to help students become responsible digital citizens.

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