Generative AI in Higher Education: A Narrative Review of Global Adoption, Ethical Challenges, and Behavioural Pathways To Critical Thinking, With Implications for African and Ghanaian Contexts

Solomon Mensah Opoku

Institute for Educational Planning and Administration, University of Cape Coast, Cape Coast, Ghana

DOI: https://doi.org/10.47772/IJRISS.2026.100700550

Received: 26 July 2026; Accepted: 31 July 2026; Published: 07 August 2026

ABSTRACT

Generative artificial intelligence (GenAI) has moved from novelty to routine presence in higher education within a few years, yet the evidence on its adoption, ethical implications, and cognitive effects remains fragmented across global, regional, and mechanism-focused literatures that are rarely read together. This narrative review synthesises 43 sources, comprising global systematic reviews and meta-analyses, comparative Global North-South studies, African and Tanzanian policy analyses, Ghana-specific empirical studies, and behavioural models linking GenAI use to critical thinking and ethical creativity. The review traces the evolution of this literature across three waves from 2022 to 2026 and finds that GenAI adoption is high globally, at roughly 74.5% among educators, and is growing rapidly across Africa, but that structural constraints, including limited infrastructure, low AI literacy, and underdeveloped institutional policy, shape a distinctly African pattern of opportunity and risk that global adoption figures obscure. In Ghana specifically, a large tertiary-institution survey shows technical infrastructure as a significant constraint even where urban-rural gaps are not, alongside evidence that roughly a third of surveyed undergraduates report low AI literacy despite substantial GenAI use. Critically, the review identifies that the empirically tested behavioural pathways linking GenAI use to critical thinking and ethical creativity, through self-regulated learning, innovative behaviour, and reduced reliance on prior knowledge, have been tested only in Taiwanese and Chinese settings, leaving open whether the same mechanisms hold under African infrastructural and institutional conditions. The review concludes with practical implications for institutions and policymakers and a concrete future-research agenda centred on this gap, arguing that testing these pathways in Ghana is the field's single most valuable next study.

Keywords: Generative artificial intelligence; higher education; Ghana; critical thinking; digital divide

INTRODUCTION

In only a few short years, ChatGPT and other generative AI technologies have gone from being unique to being commonplace in higher education. Adoption is high worldwide: the largest empirical study to date, involving 23,218 students in 109 countries, confirmed generally positive perceptions along with strong support for regulation (Ravšelj et al., 2025). A survey of 350 educators across regions found 74.5% overall adoption, rising to 78.9% in Asia (Pandey & Pandey, 2026). This quick uptake has frequently been framed around possibilities and difficulties (Chiu et al., 2023; Ryzheva et al., 2024). However, adoption statistics by themselves do not tell us much about whether GenAI is helping learning or whether its impacts are context-neutral. Adoption and perception actually differ between the Global North and Global South, according to comparative research (Sharma & Ha, 2025). Studies conducted at the national level in the Philippines (Espartinez, 2025), the United Arab Emirates (Youssef et al., 2024), and throughout Africa (Onyebuchi et al., 2024) demonstrate that this variation is structural rather than incidental.

Two literary traditions have emerged almost simultaneously. The first records institutional preparedness, adoption trends, and ethical issues both globally (Abdallah et al., 2025; Ansari et al., 2024; Baig & Yadegaridehkordi, 2024; Chang et al., 2024; Deng et al., 2025; Jin & Sercu, 2025; Montenegro-Rueda et al., 2023; Pandey & Pandey, 2026; Ravšelj et al., 2025; Yu et al., 2024; Zamfiroiu et al., 2023). The second,

considerably smaller body of work focuses on what happens to students' thinking when they use GenAI rather than whether or not they utilize it. GenAI use was linked to self-regulated learning and innovative behavior, which in turn predicted critical thinking and ethical creativity, according to a Taiwanese study (Jou & Kao, 2026). This mechanism is supported by Chinese experimental evidence that shows GenAI use enhances critical thinking while lowering reliance on prior knowledge (Zhao et al., 2025) and by blended learning research that shows guided ChatGPT use can strengthen self-regulated learning and higher-order thinking skills (Lee et al., 2024). None of this behavioural evidence has been tested in Ghana or Africa, where institutional preparedness and infrastructure limitations are very different from the well-resourced environments where it was established.

These literary works are brought together in this narrative review. What would it take to determine whether the critical-thinking pathway seen elsewhere holds true in Ghanaian and African contexts, and what does the data from both Africa and the rest of the world say about the acceptance of GenAI and its ethical concerns in higher education? 43 sources were examined; Section 2 explains why they were chosen, Table 1 summarizes them, and the ensuing sections address them topically.

METHODOLOGY

Instead of being a systematic review, this is a tale. Search terms that combine "generative AI," "ChatGPT," or "artificial intelligence" with "higher education," "systematic review," "Ghana," "Africa," "critical thinking," and "academic integrity" are run against Google Scholar, journal databases, and general web search. The most pertinent results are then cited. Sources that either (a) modelled a behavioural or cognitive mechanism connecting GenAI use to higher-order outcomes like critical thinking, or (b) were peer-reviewed systematic reviews, meta-analyses, or empirical studies on GenAI adoption, ethics, or institutional readiness in higher education globally, regionally, or in Africa/Ghana specifically were included. Peer-reviewed journal sources were given priority; a few grey-literature sources (two institutional/journalistic reports, an arXiv preprint, and a conference proceeding) were only kept if they provided Ghana-specific evidence that could not be found elsewhere, like actual institutional policy changes or national connectivity statistics.

The selection process itself proceeded iteratively rather than through a single fixed-count database query. Search terms were run across Google Scholar, journal databases, and general web search, with each results page screened for topical relevance before the next query was refined; forward and backward citation-chasing from the most relevant retained sources was then used to identify additional candidate studies, which were screened against the same inclusion criteria. Sources were excluded at this stage if they addressed generative AI in contexts unrelated to higher-education teaching and learning (for example, purely technical machine-learning papers with no educational application), if they substantially duplicated findings already captured by a more comprehensive systematic review or meta-analysis already retained in the sample, or if they could not be verified as a genuine, retrievable publication through a working DOI or publisher link. This iterative, citation-chasing approach is standard practice for narrative reviews but does not generate the fixed, auditable search and screen counts (for example, a PRISMA-style flow diagram with numbers identified, screened, and excluded at each stage) that systematic reviews report; the absence of such a numeric count is acknowledged here as a limitation on the transparency of the selection process, additional to the narrative-review-format limitation already noted in the Discussion.

Source quality was assessed qualitatively rather than through a formal checklist or standardised appraisal instrument, consistent with the narrative review format. Peer-reviewed journal articles were weighted more heavily than grey literature at every stage of synthesis; among peer-reviewed sources, systematic reviews and meta-analyses were treated as stronger evidence than single-institution surveys, and larger or multi-country samples were given more interpretive weight than smaller, single-site studies when their findings diverged. Where a claim rested on a single small-sample or single-institution study, this is flagged explicitly in the text rather than presented with the same confidence as findings supported by systematic reviews, meta-analyses, or multiple independent studies. This approach does not eliminate selection bias, and the absence of a formal quality-appraisal tool such as PRISMA or a critical appraisal checklist is acknowledged as a limitation of the narrative review method in the Discussion.

Rationale for Source Selection

Instead of maximizing volume, sources were selected to concurrently meet four criteria. First, the review reflects the post-ChatGPT launch literature rather than earlier, more speculative AI-in-education scholarship because all sources fall between 2022 and 2026, with the vast majority published in 2023 or after. Second, geographic breadth with regional depth: a concentrated cluster of African and Ghanaian sources (Apata et al., 2026; Matto & Ponera, 2025; Onyebuchi et al., 2024, and the Ghana-specific studies listed in Table 1), comparative Global North-South studies (Sharma & Ha, 2025), and country-specific Global South evidence (Espartinez, 2025), so that assertions made on a global scale can be verified against local and regional data rather than being taken at face value. Third, mechanism over description: this review's future research plan relies on mechanism evidence, therefore two sources (Jou & Kao, 2026; Zhao et al., 2025) were given priority since they model a behavioural or cognitive mechanism rather than merely reporting adoption rates. Fourth, methodological diversity: the review's conclusions are not based on a single methodological tradition because the reviewed sources include systematic reviews and meta-analyses, large-scale cross-sectional surveys, randomized controlled trials, qualitative case studies and narrative inquiry, scale-development studies, and policy analyses. Despite its topical proximity to "generative AI," one source that was taken into consideration during the search a deep-learning review of AI-generated visual art (Maerten & Soydaner, 2025), was rejected as being outside the purview of higher education pedagogy. This shows that inclusion was determined by relevance to teaching and learning rather than just keyword match.

Evolution Of Genai Research In Higher Education

The literature on AI in higher education has evolved in three broad waves, summarised in Table 1. The first wave, prior to ChatGPT's public release, was exploratory and largely descriptive: the field's foundational systematic review found that only 6% of AI in higher education studies were authored by education researchers, exposing weak pedagogical and ethical grounding(Long et al., 2026). The second wave, following ChatGPT's 2022 launch, produced a rapid succession of systematic reviews and early empirical studies between 2023 and 2025 (Abdallah et al., 2025; Albadarin et al., 2024; Ansari et al., 2024; Baig & Yadegaridehkordi, 2024; Chang et al., 2024; Duhaylungsod & Chavez, 2023; Jin & Sercu, 2025; Montenegro-Rueda et al., 2023; Zamfiroiu et al., 2023), converging on a now standard opportunities and challenges framework (Chiu et al., 2023; Ryzheva et al., 2024). Research from well-resourced systems dominated this wave. According to bibliometric analysis, the most productive contributing nations were China, the US, Australia, and Saudi Arabia (Chang et al., 2024). The third, more recent wave has started to address this concentration of research output. The first continent-wide African systematic review and meta-analysis (Apata et al., 2026), country-specific African policy analysis (Matto & Ponera, 2025), explicit Global North, and South comparison (Sharma & Ha, 2025), and two independent behavioral models of GenAI's impact on critical thinking (Jou & Kao, 2026; Zhao et al., 2025) are examples of this third wave, which focuses on mechanism rather than just adoption. When taken as a whole, this process shows that the field is evolving from asking whether GenAI is used to asking how it alters thinking and where in the world that question has been and has not yet been answered.

Table 1. Summary of Reviewed Literature on Generative AI in Higher Education

Author(s)	Year	Country/Region	Design	Sample	Major Findings	Contribution
Duhaylungsod & Chavez	2023	Philippines	Study	AI users	ChatGPT use linked to innovative, utilitarian value and a mindset shift toward AI-assisted work.	Early Global South evidence of attitudinal change toward GenAI.
Montenegro-Rueda et al.	2023	Global	Systematic Review	12 studies	Early evidence of engagement gains but a very limited post-launch empirical base.	Marks the start of the post-ChatGPT-launch research wave.

Chiu et al.	2023	Global	Systematic Literature Review	Published Studies	Identified opportunities, challenges, and future research priorities.	Provides the review's core conceptual framework.
Cotton, Cotton, & Shipway	2023	United Kingdom/Global	Conceptual Analysis	Higher education	Academic integrity requires institutional adaptation, not prohibition.	Foundation for ethical governance discussion.
Elkhatat, Elsaid, & Almeer	2023	Global	Experimental Study	20 texts, 5 detection tools	AI-detection tools were more accurate for GPT-3.5 than GPT-4 and produced false positives on human text.	Grounds the academic-integrity discussion in peer-reviewed detection evidence.
Miao & Holmes (UNESCO)	2023	Global	Policy Guidance	International Systems	Calls for human-centred, ethical, inclusive AI governance.	Frames the policy discussion globally.
Zamfiroiu et al.	2023	Global	Systematic Review	Published Papers	Synthesised early ChatGPT research across disciplines.	Complements the 2023 wave of post-launch reviews.
Albadarin et al.	2024	Global	Systematic Literature Review	14 studies	Predominantly positive impacts on learning motivation and understanding.	Early empirical synthesis complementing later reviews.
Baig & Yadegaridehkordi	2024	Global	Systematic Literature Review	Published studies	Identified over-reliance, equity gaps, inconsistent institutional guidance.	Frames unresolved challenges relevant to Africa.
Ansari et al.	2024	Global	Systematic Scoping Review	Published studies	Uneven geographic distribution of GenAI research output.	Highlights the research imbalance this review helps correct.
Chang, Chen, & Tang	2024	Global	Bibliometric Analysis	50 articles	China, US, Australia, and Saudi Arabia were the most productive contributors.	Evidences concentration of research in well-resourced systems.
Ryzheva et al.	2024	Global	Literature Review	Published studies	AI offers benefits but introduces ethical and governance challenges.	Reinforces the opportunities/challenges framing.
Lee et al.	2024	Taiwan	Randomized Controlled Trial	61 undergraduates	Guided ChatGPT use improved self-regulated learning	Experimental support for the behavioral pathway.

					and higher-order thinking.	
Yu, Yan, & Cai	2024	Global	Survey	328 students	Usefulness, ease of use, and social norms shaped continued-use intention.	Explains behavioural drivers of adoption.
Loglo	2024	Ghana	Qualitative Case Study	Public Universities	Leadership and infrastructure shape digital transformation.	Explains institutional barriers to AI implementation.
Asamoah et al.	2024	Ghana	Survey	University Faculty	Faculty acceptance of LMS platforms remains uneven.	Indicates foundational digital readiness for AI integration.
Baidoo-Anu et al.	2024	Ghana	Survey; Scale Validation	277 students	Students generally perceive ChatGPT positively for learning.	Validates student perceptions of GenAI.
Guadu et al.	2026	Africa (multi-country)	Systematic Conceptual Review	42 sources	AI-driven plagiarism risks are exacerbated by policy gaps, digital illiteracy, and cultural views of authorship.	Peer-reviewed African evidence that academic-integrity policy is adapting to GenAI.
Youssef et al.	2024	UAE	Survey	University students	ChatGPT use linked to academic achievement gains.	Global South (MENA) comparator for learning outcomes.
Onyebuchi et al.	2024	Africa (multi-country)	Review	African HE systems	AI is transforming African learning environments unevenly across countries.	Continental context alongside Apata et al.'s systematic review.
Jin & Sercu	2025	Global	Systematic Review (Experimental)	21 studies	Knowledge acquisition gains were more consistent than higher-order-skill gains.	Distinguishes lower- vs higher-order learning outcomes.
Deng et al.	2025	Global	Systematic Review & Meta-analysis	Experimental studies	ChatGPT significantly improves learning outcomes.	Quantitative evidence for GenAI's educational effectiveness.
Abdallah et al.	2025	Global	Systematic Review	39 studies	Integrated cognitive, emotional, and social dimensions of GenAI use.	Broadens the review beyond academic outcomes.
Ravšelj et al.	2025	Global (109 countries)	Large-scale Survey	23,218 students	Broad support for AI regulation alongside positive perceptions.	Largest global dataset on student perceptions.
Kwakye et al.	2025	Ghana	Cross-sectional Survey	353 students	High awareness and widespread GenAI use among Ghanaian students.	Demonstrates rapid local adoption.

Espartinez	2025	Philippines	Narrative Inquiry	Students & teachers	Explored lived experiences with ChatGPT in higher education.	Qualitative Global South comparator to Ghanaian evidence.
Hassen	2025	Global	Study	University students	AI use linked to gains in reading, critical thinking, and problem-solving.	Direct evidence for GenAI's cognitive-skill opportunities.
Kilde-Westberg et al.	2025	Sweden	Case Study	Physics lab course	GenAI functioned effectively as a collaborative 'lab partner.'	Illustrates institutional/instructional support use-cases.
Matto & Ponera	2025	Tanzania	Policy Analysis	Higher education institutions	Analysed AI policy perspectives across Tanzanian universities.	Direct East African policy comparator to Ghana.
Sharma & Ha	2025	Global North/South	Comparative Study	College students	Adoption and perception of ChatGPT differ between Global North and South.	Frames Ghana's experience within a North–South comparative lens.
Pandey & Pandey	2026	Global	Cross-sectional Survey	350 educators	AI adoption reached 74.5%; training and literacy remain major barriers.	Shows adoption outpacing preparedness.
Jou & Kao	2026	Taiwan	Mixed Methods	384 students	Self-regulated learning and innovative behaviour mediate GenAI's effect on critical thinking and ethical creativity.	Introduces the core behavioural mechanism this review foregrounds.
Apata et al.	2026	Africa	Systematic Review & Meta-analysis	39 studies	Opportunities coexist with infrastructure and digital-divide challenges.	Continent-wide evidence for African higher education.
Essel et al.	2026	Ghana	Cross-sectional Survey	969 students	Over half lacked prior AI experience; AI literacy remained low despite use.	Highlights the adoption/literacy paradox.
Darko, Qi, & Wang	2026	Ghana	Survey	K–12 teachers	GenAI adoption improved instructional confidence and self-efficacy.	Complementary evidence from Ghana's school sector.
Partey et al.	2026	Ghana	Quantitative Survey	Preservice teachers	TTF and TPB constructs significantly	Explains behavioural determinants among future educators.

					predicted GenAI adoption.	
Yamson et al.	2026	Ghana	Staff Survey	4 institutions	ChatGPT improved institutional communication; governance concerns persisted.	Illustrates institutional-level adoption in Ghana.
Aposika	2026	Ghana	Cross-sectional Survey	800 students/faculty/admin	Found no significant urban–rural difference in ICT availability within tertiary institutions, though private institutions scored higher.	Peer-reviewed, nuanced replacement for national connectivity claims.
Saarela et al.	2026	Global	Meta-analysis	Language learners	GenAI improves language proficiency and affective-cognitive outcomes.	Extends the review's evidence on domain-specific learning gains.
Xiao et al.	2026	Global (K–12 focus)	Qualitative Study	Teachers, multiple countries	Teachers fear GenAI may widen educational inequality.	Direct equity concern paralleling Ghana's digital-divide evidence.
Zhao et al.	2025	China	Experimental Study	University students	GenAI amplifies critical thinking and reduces reliance on prior knowledge.	Second empirical model of GenAI's effect on critical thinking, alongside Jou & Kao.
Amankwah et al.	2022	Ghana	Survey	University Teachers	Persistent teacher concerns about digital learning platforms.	Shows GenAI adoption builds on prior digital-transformation challenges.

Global Adoption Of Generative Ai In Higher Education

In the majority of higher education systems examined, student and teacher adoption of GenAI is now the rule rather than the exception. According to global survey data, educator adoption is 74.5% overall, with regional variations ranging from 78.9% in Asia to 64.4% in Europe (Pandey & Pandey, 2026). Student users' satisfaction and intention to continue using the technology are influenced by perceived utility, ease of use, and peer social norms (Yu et al., 2024). Students used GenAI mainly for brainstorming, summarizing texts, and finding research articles, according to the largest study to date, which involved 23,218 students from 109 countries. They also reported generally positive emotional responses along with a clear preference for regulation (Ravšelj et al., 2025). However, adoption is not consistent: a direct global North-South comparison reveals consistently distinct adoption and perception patterns (Sharma & Ha, 2025), which is supported by national studies in the Philippines (Espartinez, 2025) and the United Arab Emirates (Youssef et al., 2024). Ghana-specific indicators are positioned in relation to these global adoption figures in Figure 1. While global and Asian adoption rates surpass 74%, an estimated 69% of surveyed Ghanaian undergraduates report any prior AI experience (Essel et al., 2026). Additionally, a large survey of 800 participants across Ghanaian tertiary institutions found no statistically significant urban-rural difference in ICT availability within those institutions specifically, despite private institutions scored slightly higher than public ones (Aposika, 2026). While institutional type and AI-literacy gaps continue to be the more discriminating constraints, this is a useful complication rather than a straightforward

confirmation of the digital divide: it suggests that within-institution ICT provision in Ghana may be more level than national household-level connectivity statistics would imply.

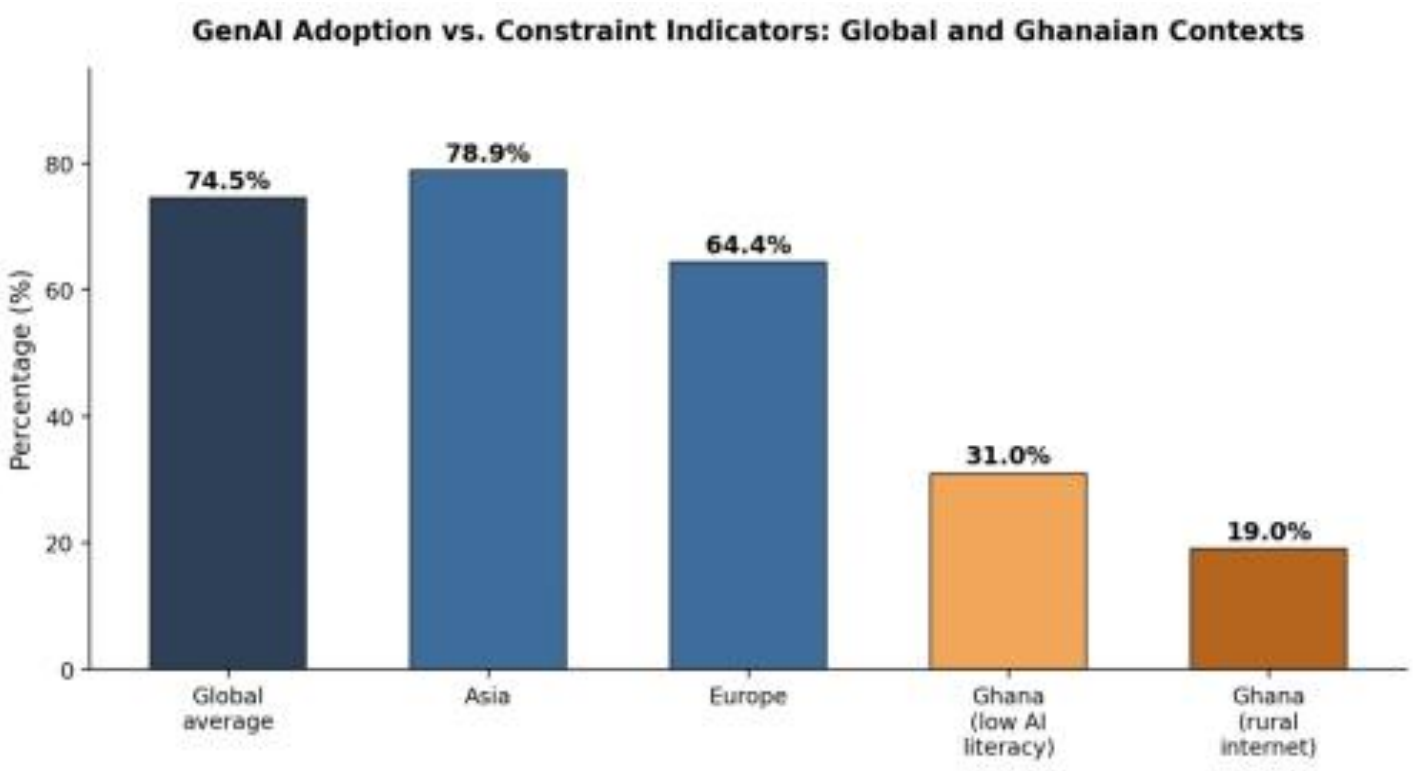

Figure 1. GenAI adoption rates and structural constraint indicators across global and Ghanaian contexts.

Opportunities Of Generative Ai In Higher Education

Learning Gains and Academic Support

GenAI is reliably linked to quantifiable, if inconsistent, learning advantages throughout the systematic reviews and empirical experiments reviewed. ChatGPT use was linked to learning gains across several experimental outcome measures, according to a meta-analysis of 22 systematic reviews (Deng et al., 2025). Similarly, a review limited to true experimental designs found that GenAI-based interventions were generally effective for knowledge acquisition, though effects on skill development varied by intervention type and duration (Jin & Sercu, 2025).This pattern is supported by domain-specific evidence: a meta-analysis found that GenAI enhances language proficiency and affective-cognitive outcomes among language learners (Saarela et al., 2026); a case study found that GenAI worked well as a cooperative laboratory partner in an undergraduate physics course (Kilde-Westberg et al., 2025); and survey data from the UAE directly linked ChatGPT use to improvements in academic achievement (Youssef et al., 2024). Additionally, there is direct evidence linking the use of AI to increases in reading, critical thinking, and problem-solving abilities (Hassen, 2025) as well as a more general shift in perspective toward creative, practical use of AI tools (Duhaylungsod & Chavez, 2023). Even though half of the 969 undergraduates in Ghana had no prior AI experience, GenAI perception accounted for 75.8% of the variance in learning autonomy (Essel et al., 2026). Additionally, a validated experience scale confirms that students' own evaluations of ChatGPT as a learning tool are generally positive (Baidoo-Anu et al., 2024).

Institutional and Instructional Support

GenAI is being used for educational and institutional reasons in addition to individual learning. Despite ongoing worries about integrity, Ghanaian academic personnel from four institutions claimed that ChatGPT improved communication and collaboration (Yamson et al., 2026). Adoption of GenAI at the teacher-education level has

been associated with academic performance, instructional confidence, and self-efficacy among preservice and in-service teachers (Darko et al., 2026; Partey et al., 2026).

Challenges Of Generative Ai In Higher Education

Digital Divide and Infrastructure Constraints

Infrastructure-related adoption problems are unique to African higher education institutions. The research itself was focused in the comparatively better-resourced systems of South Africa, Egypt, and Nigeria (Apata et al., 2026). This pattern is echoed in Tanzanian policy analysis showing uneven institutional readiness across universities (Matto & Ponera, 2025) and in a broader review of AI's uneven transformation of African learning environments (Onyebuchi et al., 2024). The systematic review and meta-analysis of 39 studies found that the digital divide was one of the continents. Even though institutional type (public/private) mattered more than urban/rural location for ICT availability, a large 800 participant survey across tertiary institutions in Ghana specifically found technical challenges to be a statistically significant constraint on ICT use (Aposika, 2026). Case-study evidence from Ghanaian public universities highlights how infrastructural limitations limit institutional leadership's ability to drive digital transformation (Loglo, 2024). The implications of this disparity are further supported by qualitative data from around the world. Teachers in a number of nations have voiced concern that if access to GenAI stays unequal, it may increase rather than decrease educational inequality (Xiao et al., 2026).

Academic Integrity and Ethical Governance Gaps

Adoption has outpaced ethical governance. UNESCO's first global guidance on generative AI in education, which frames the lack of national regulation as a risk to equity and human agency (Miao & Holmes, 2023), echoes the now foundational global account of this issue, which argued that universities must take a proactive, ethical approach to GenAI rather than relying on detection and prohibition alone (Cotton et al., 2023). Experimental work on AI-text detection tools illustrates why detection alone is an unreliable strategy: detectors were found to be more accurate at identifying GPT-3.5 output than GPT-4, and produced false positives when applied to genuinely human-written text (Elkhatat, Elsaid, & Almeer, 2023), reinforcing the same caution raised on ethical grounds (Cotton et al., 2023). Globally, educators rate transparency and data protection as highly important, yet report insufficient training and low AI literacy as the main barriers to responsible use (Pandey & Pandey, 2026), and large-scale student survey evidence confirms broad support for stronger AI regulation, driven partly by concerns over cheating and plagiarism (Ravšelj et al., 2025). According to Guadu et al. (2026), a systematic conceptual review of 42 sources in Africa specifically found that policy gaps, digital illiteracy, and different cultural understandings of authorship exacerbate the risks of AI-driven plagiarism and that detection technology alone cannot solve the issue. The African systematic review also identified academic misconduct as one of the most frequently reported ethical concerns throughout the continent (Apata et al., 2026).

AI Literacy Gaps and Institutional Readiness

The infrastructure and integrity issues are made worse by low AI literacy. In Ghana, nearly one-third of surveyed undergraduates reported inadequate AI literacy despite significant GenAI use (Essel et al., 2026), while just 6.3% of educators in a global sample identified as AI experts (Pandey & Pandey, 2026). The adoption of GenAI appears to be layered on top of an already uneven digital foundation, as evidenced by Ghanaian faculty's uneven acceptance of even basic tools like learning management systems (Asamoah et al., 2024) and university instructors' ongoing concerns about adopting platforms like Moodle (Amankwah et al., 2022).

Behavioral Pathways To Critical Thinking And Ethical Creativity

In African contexts, the most theoretically significant opportunity found in this review has also received the least amount of testing. GenAI use was found to be highly correlated with self-regulated learning and innovative behaviour, which in turn predicted critical thinking and creative integrity, with all indirect mediation routes statistically significant, according to a study of 384 Taiwanese design students (Jou & Kao, 2026). This conclusion is independently supported by research from blended learning, where a guidance-based ChatGPT

tool enhanced both self-regulated learning and higher-order thinking skills in comparison to unguided use (Lee et al., 2024), and Chinese experimental evidence demonstrating that GenAI use enhances critical thinking skills specifically by decreasing students' reliance on prior knowledge rather than merely supplementing it (Zhao et al., 2025). Confidence that the pathway is genuine rather than a single-sample artifact is significantly increased by the fact that three independent research conducted in three different nations and fields converge on a similar mechanism. However, all three were carried out in highly connected, well-resourced environments where AI was used almost universally and frequently. This review contends that the single most relevant next study for African higher education research is whether the same self-regulation and innovation pathway's function when students encounter the literacy and infrastructure limitations listed in Section 6. This suggested route is shown in Figure 2 along with potential moderating African and Ghanaian limitations.

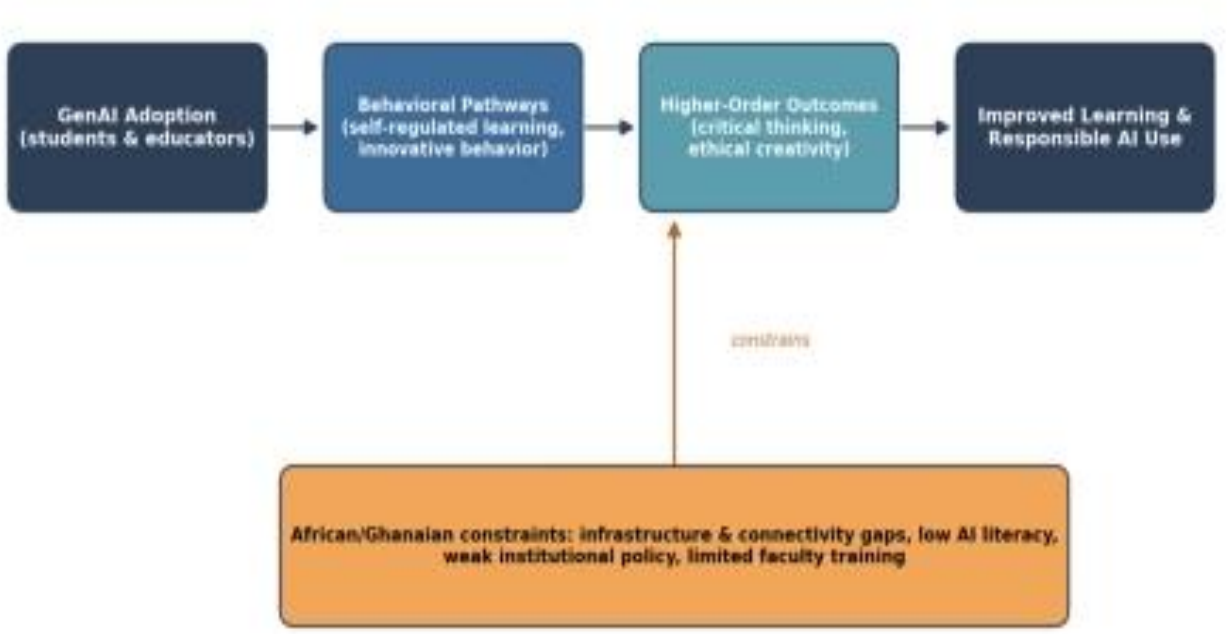

Figure 2. Proposed behavioural pathway from GenAI adoption to critical thinking and ethical creativity, as potentially constrained by African infrastructural and institutional conditions.

DISCUSSION

When taken as a whole, the 43 sources in this evaluation present a cohesive narrative with a single, obvious gap at its core. From descriptive mapping (Zawacki-Richter et al., 2019) to a concentrated burst of opportunity/challenge systematic reviews dominated by well-resourced research systems (Abdallah et al., 2025; Ansari et al., 2024; Chang et al., 2024; Deng et al., 2025; Montenegro-Rueda et al., 2023; Ravšelj et al., 2025; Yu et al., 2024). Finally, a third wave focused on behavioural mechanisms and regional grounding (Apata et al., 2026; Jou & Kao, 2026; Matto & Ponera, 2025). Students and staff report improvements in autonomy, engagement, and institutional efficiency across all three waves (Baidoo-Anu et al., 2024; Deng et al., 2025; Hassen, 2025; Lee et al., 2024; Yamson et al., 2026), and there is a strong global regulatory appetite (Miao & Holmes, 2023; Pandey & Pandey, 2026; Ravšelj et al., 2025). However, adoption is outpacing infrastructure, literacy, and governance, especially in African contexts where there are still disparities in connectivity, institutional preparedness, and clear policy (Apata et al., 2026; Aposika, 2026; Asamoah et al., 2024; Guadu et al., 2026; Loglo, 2024; Xiao et al., 2026). The global (Pandey & Pandey, 2026; Ravšelj et al., 2025), comparative (Sharma & Ha, 2025), African (Apata et al., 2026; Matto & Ponera, 2025; Onyebuchi et al., 2024), and Ghanaian (Aposika, 2026; Essel et al., 2026; Loglo, 2024) data reviewed.

However, the most significant gap this analysis finds relates to mechanism rather than adoption rates. The only sources in this review that explain how GenAI use might translate into the higher-order thinking skills that higher education is intended to foster are behavioural models that link GenAI use to critical thinking and ethical creativity through self-regulated learning, innovative behaviour, and decreased reliance on prior knowledge (Jou & Kao, 2026; Lee et al., 2024; Zhao et al., 2025). None of the Ghanaian or African evidence evaluated here supports the idea that the same pathway holds when a third of students have low AI literacy. All three were tested in well-resourced, non-African settings (Essel et al., 2026). This is not an assumption that this review can address; rather, it is a truly open empirical inquiry.

As explained in Section 2.1, the scope of this evaluation should be interpreted as a narrative rather than a systematic review. Instead of conducting a thorough, pre-registered search of every database, sources were chosen based on their relevancy, recentness, and regional balance. Because they provide Ghana-specific evidence, a genuine policy change, and national connectivity data not found in the peer-reviewed record, a small number of grey-literature sources were kept. The review's geographical foundation and currency are strengthened by these decisions, but the synthesis should be interpreted as illustrative rather than comprehensive.

A further limitation concerns the comparability of the quantitative figures reported across the reviewed studies. The sources synthesised here measured GenAI adoption and its correlates using markedly different instruments and designs: some report self-reported adoption rates from cross-sectional surveys, others rely on established technology-acceptance constructs such as TAM, UTAUT, or the TTF-TPB model, others use experimental pre-post learning-outcome measures, and still others draw on qualitative case studies or policy analysis. Headline figures quoted in this review, such as the 74.5 percent global educator-adoption rate (Pandey & Pandey, 2026) or the learning-autonomy variance reported among Ghanaian undergraduates (Essel et al., 2026), were therefore not generated by a common measurement instrument and should not be read as directly comparable data points on a single scale. They are better understood as convergent qualitative signals pointing toward a shared pattern, adoption outpacing readiness, rather than as precise, additive statistics; future primary research adopting a shared measurement framework across contexts would be needed to establish genuinely comparable figures.

Practical Implications

Three priorities are suggested by the evidence examined here for universities. First, since data from Ghana (Essel et al., 2026) and around the world (Pandey & Pandey, 2026) indicates significant gaps even among regular users, institutions should approach AI-literacy training as essential infrastructure rather than optional professional development. Second, rather than a detection and punishment strategy whose technical limitations are well known (Elkhatat et al., 2023), academic integrity policy should adhere to the proactive, ethics-first model promoted globally (Cotton et al., 2023; Miao & Holmes, 2023) and echoed in African-specific analysis (Guadu et al., 2026). Third, institutional GenAI strategy should prioritize instructional design rather than access alone due to the proven benefits of guided rather than unguided GenAI use for higher-order thinking (Lee et al., 2024; Zhao et al., 2025). Together with the infrastructure limitations found in all African institutions (Apata et al., 2026; Loglo, 2024; Matto & Ponera, 2025), the discovery that institutional type, rather than just urban/rural location is the more discriminating factor in Ghana's ICT provision (Aposika, 2026) suggests that AI in education policy should focus on particular institutional gaps rather than assuming a uniform geographic divide.

Future Research

Testing the self regulated learning, innovative behaviour, and reduced prior knowledge reliance pathways to critical thinking and ethical creativity among students and educators in Ghanaian or other African higher education institutions, and more broadly in other developing-country contexts facing comparable infrastructural constraints, using a similar mixed-methods design is the single highest-priority research direction that follows directly from this review (Jou & Kao, 2026; Lee et al., 2024; Zhao et al., 2025). It is conceivable that the pathway could be weaker, stronger, or differently mediated in this context given the literacy and infrastructure limitations listed in Section 6. Second, future research should investigate whether adoption patterns or ethical outcomes are substantially altered over time by Ghana's developing institutional responses to academic integrity and the regional trends found throughout African higher education (Guadu et al., 2026). Third, building on earlier

comparative work between Ghana, Tanzania, and the larger continent (Onyebuchi et al., 2024), comparative research across African higher education systems with varying connectivity and policy environments would help determine the extent to which the pattern found in Section 6.1 is a truly regional constraint versus an artifact of particular national conditions.

Fourth, because the sources reviewed here concentrate on a small number of relatively well-studied African systems, future work should map GenAI adoption patterns across a wider and more representative set of African countries specifically, rather than treating "Africa" as a single adoption context; doing so would clarify how much of the pattern identified in this review reflects genuinely continent-wide dynamics as opposed to country-specific regulatory, infrastructural, or institutional conditions that vary considerably between, for example, Ghana, Tanzania, Nigeria, Egypt, and South Africa. Fifth, future research should examine institutional strategies for AI governance and faculty training directly, since this review's evidence base documents the existence of governance gaps and training deficits (Miao & Holmes, 2023; Pandey & Pandey, 2026) without yet evaluating which institutional strategies, such as formal AI-use policies, TPACK-organised faculty development programmes, or dedicated GenAI oversight committees, are effective at closing them in practice.

CONCLUSION

The evidence reviewed here, which spans 43 sources from the field's earliest systematic mapping in 2022 to its most recent behavioural and regional studies in 2026, demonstrates real opportunities for learner autonomy, institutional efficiency, and instructional support. Generative AI is being rapidly adopted across higher education globally and in Africa. However, adoption has surpassed ethical governance, AI knowledge, and infrastructure, especially in Ghana and other African contexts where institutional preparedness and connectivity are still uneven. Most significantly, this review demonstrates that because GenAI has only ever been tested in well-resourced, non-African settings, the field does not yet know whether its most promising cognitive effect, its association with critical thinking and ethical creativity through self-regulated learning, innovative behaviour, and reduced reliance on prior knowledge that actually holds under African conditions. Closing that gap is a logical next step for research based on the Ghanaian setting as well as a significant contribution to the worldwide literature.

ACKNOWLEDGEMENT

I wish to express my profound gratitude to the Almighty God for granting me good health, strength, and guidance throughout the course of this research.

I am deeply indebted to Rev. Fr. Raymond C. Tangonyire, SJ, and Professor Marie A.B. Bakah for their valuable support, guidance, and encouragement. Their contributions played a significant role in the successful completion of this work.

I also extend my sincere appreciation to my family and friends for their unwavering support, encouragement, and understanding throughout this academic journey.

REFERENCES

1. Abdallah, N., Katmah, R., Khalaf, K., & Jelinek, H. F. (2025). Systematic review of ChatGPT in higher education: Navigating impact on learning, wellbeing, and collaboration. Social Sciences & Humanities Open, 12, 101866.
2. Albadarin, Y., Saqr, M., Pope, N., & Tukiainen, M. (2024). A systematic literature review of empirical research on ChatGPT in education. Discover Education, 3(1), 1-26.
3. Amankwah, F., Sarfo, F. K., Aboagye, M. O., Konin, D., & Dzakpasu, R. K. (2022). Concerns of university teachers about the adoption of the Moodle learning management system in a Ghanaian University campus. Education Inquiry, 15(3), 312-332.

4. Ansari, A. N., Ahmad, S., & Bhutta, S. M. (2024). Mapping the global evidence around the use of ChatGPT in higher education: A systematic scoping review. Education and Information Technologies, 29(9), 11281-11321.
5. Apata, O. E., Ajose, S. T., Oyewole, P. O., Taheri, M., Olaitan, G. I., Ajamobe, J. O., Hunwathan, O. L., Ogunwale, O. M., Feyijimi, T. R., & Adebambo, O. O. (2026). Generative artificial intelligence use and adoption in African higher education among students and lecturers: A systematic review and meta-analysis. Journal of Service Science and Management, 19(3).
6. Aposika, F. (2026). Digital transformation in higher education in Ghana with focus on ICT access utilization and policy challenges. Discover Education, 5(1), 410.
7. Asamoah, M. K., Oheneba-Sakyi, Y., & Tagoe, M. (2024). Faculty acceptance of the utilization of learning management systems in teaching. E-Learning and Digital Media, 21(4), 346–366.
8. Baidoo-Anu, D., Asamoah, D., Amoako, I., & Mahama, I. (2024). Exploring student perspectives on generative artificial intelligence in higher education learning. Discover Education, 3(1), 1-21.
9. Baig, M. I., & Yadegaridehkordi, E. (2024). ChatGPT in the higher education: A systematic literature review and research challenges. International Journal of Educational Research, 127, 102411.
10. Chang, C.-Y., Chen, I.-H., & Tang, K.-Y. (2024). Roles and research trends of ChatGPT-based learning: A bibliometric analysis and systematic review. Educational Technology & Society, 27(4), 471–486.
11. Chiu, T. K., Xia, Q., Zhou, X., Chai, C. S., & Cheng, M. (2023). Systematic literature review on opportunities, challenges, and future research recommendations of artificial intelligence in education. Computers and Education: Artificial Intelligence, 4, 100118.
12. Cotton, D. R. E., Cotton, P. A., & Shipway, J. R. (2023). Chatting and cheating: Ensuring academic integrity in the era of ChatGPT. Innovations in Education and Teaching International, 61(2), 228-239.
13. Darko, N., Qi, Z., & Wang, Z. (2026). Generative AI adoption and its impact on teachers' self-efficacy and instructional confidence in Ghana. Frontiers in Artificial Intelligence, 9, 1829056.
14. Deng, R., Jiang, M., Yu, X., Lu, Y., & Liu, S. (2025). Does ChatGPT enhance student learning? A systematic review and meta-analysis of experimental studies. Computers & Education, 227, 105224.
15. Duhaylungsod, A. V., & Chavez, J. V. (2023). ChatGPT and other AI users: Innovative and creative utilitarian value and mindset shift. Journal of Namibian Studies: History Politics Culture, 33.
16. Elkhatat, A. M., Elsaid, K., & Almeer, S. (2023). Evaluating the efficacy of AI content detection tools in differentiating between human and AI-generated text. International Journal for Educational Integrity, 19(1), 1-16.
17. Espartinez, A. S. (2025). Between innovation and tradition: A narrative inquiry of students' and teachers' experiences with ChatGPT in Philippine higher education. Social Sciences, 14(6).
18. Essel, H. B., Vlachopoulos, D., Johnson, E. E., & Quansah, E. K. (2026). Undergraduate students' perceptions of generative artificial intelligence as a predictor of learning autonomy in Ghana. Discover Artificial Intelligence, 6(1), 85.
19. Hassen, M. (2025). The impact of AI on students' reading, critical thinking, and problem-solving skills. American Journal of Education and Information Technology, 9(2), 82–90.
20. Jin, Y., & Sercu, L. (2025). ChatGPT interventions in higher education: A systematic review of experimental studies. Journal of Computer Assisted Learning, 41, e70072.
21. Jou, M., & Kao, C.-C. (2026). Reframing human–AI collaboration in higher education: Behavioral pathways from generative AI to critical thinking and ethical creativity. Journal of Computing in Higher Education.
22. Kilde-Westberg, S., Johansson, A., & Enger, J. (2025). Generative AI as a lab partner: A case study. Physical Review Physics Education Research, 21(2).
23. Kwakye, I. N., Kwakye, K. A. P., Adom-Fynn, D., Mensah, F. E., & Agyei, S. D. (2025). Exploring the use of generative artificial intelligence tools among university students in Ghana. Discover Education, 4(1), 432.
24. Lee, H.-Y., Chen, P.-H., Wang, W.-S., Huang, Y.-M., & Wu, T.-T. (2024). Empowering ChatGPT with guidance mechanism in blended learning: Effect of self-regulated learning, higher-order thinking skills, and knowledge construction. International Journal of Educational Technology in Higher Education, 21(1), 128.

25. Loglo, F. S. (2024). Towards digital transformation of selected Ghanaian public universities: Leadership enablers, challenges, and opportunities. Open Praxis, 16(3), 374-395.
26. Guadu, Z. B. (2026). Academic integrity in the age of AI: Challenges and strategies for African higher education. Discover Education, 5, Article 21.
27. Matto, G., & Ponera, J. (2025). Artificial intelligence in higher education institutions in Tanzania: Analysis of policy perspectives. Interdisciplinary Journal of Education Research, 7(1), a13.
28. Miao, F., & Holmes, W. (2023). Guidance for generative AI in education and research. UNESCO.
29. Montenegro-Rueda, M., Fernández-Cerero, J., Fernández-Batanero, J. M., & López-Meneses, E. (2023). Impact of the implementation of ChatGPT in education: A systematic review. Computers, 12(8), 153.
30. Onyebuchi, C. N., Unachukwu, C. C., & Osawaru, B. (2024). Review of AI in education: Transforming learning environments in Africa. International Journal of Applied Research in Social Sciences, 5(10), 637-654.
31. Pandey, A., & Pandey, A. (2026). AI integration in education: Global educators' perspectives on adoption, challenges, and ethical imperatives. Innovare Journal of Education, 14(2), 1-121.
32. Partey, P. A., Quayson, E., Adjei, S. K., & Antwi, J. (2026). Determinants of generative AI adoption in teacher education: A TTF–TPB model tested with PLS-SEM. Journal of Educational Technology Development and Exchange, 19(2).
33. Ravšelj, D., Keržič, D., Tomaževič, N., Umek, L., Brezovar, N., Iahad, N. A., et al. (2025). Higher education students' perceptions of ChatGPT: A global study of early reactions. PLoS ONE, 20(2), e0315011.
34. Ryzheva, N., Nefodov, D., Romanyuk, S., Marynchenko, H., & Kudla, M. (2024). Artificial intelligence in higher education: Opportunities and challenges. Amazonia Investiga, 13(73), 284-296.
35. Saarela, M., Gunasekara, S., & Kumarage, P. (2026). A meta-analysis of generative AI effects on language proficiency and affective-cognitive outcomes in language learning. Discover Computing, 29(1).
36. Sharma, S., & Ha, L. (2025). Generative AI in higher education: A comparative study of ChatGPT adoption, perception, and use among college students in the Global North and Global South. Human-Machine Communication, 11, 107-126.
37. Xiao, R., Xiao, Q., Hou, X., Moletsane, P. P., Jane Li, H., Shen, H., & Stamper, J. (2026). Do teachers dream of GenAI widening educational (in)equality? Envisioning the future of K-12 GenAI education from global teachers' perspectives. Conference on Human Factors in Computing Systems-Proceedings.
38. Yamson, G. C., Agbamey, J., Yamson, E. D., Gyampo, A. E., Nyarko, J., & Asiamah, T. A. (2026). Transforming higher education: ChatGPT as a tool for enhanced communication and collaboration. Artificial Intelligence in Education, 2(2), 116-139.
39. Youssef, E., Medhat, M., Abdellatif, S., & Al Malek, M. (2024). Examining the effect of ChatGPT usage on students' academic learning and achievement: A survey-based study in Ajman, UAE. Computers and Education: Artificial Intelligence, 7.
40. Yu, C., Yan, J., & Cai, N. (2024). ChatGPT in higher education: Factors influencing ChatGPT user satisfaction and continued use intention. Frontiers in Education, 9, 1354929.
41. Zamfiroiu, A., Vasile, D., & Savu, D. (2023). ChatGPT-A systematic review of published research papers. Informatica Economica, 27(1), 5-16.
42. Zhao, G., Sheng, H., Wang, Y., Cai, X., & Long, T. (2025). Generative artificial intelligence amplifies the role of critical thinking skills and reduces reliance on prior knowledge while promoting in-depth learning. Education Sciences, 15(5).