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ChatGPT and Epistemic Dependency in African Higher Education: A Comparative Study of Burundi and Sierra Leone

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ABSTRACT

The increasing integration of generative artificial intelligence (AI) into higher education is reshaping knowledge acquisition and academic learning processes. While existing scholarship emphasizes AI-enabled educational opportunities, it has paid limited attention to how sustained engagement with generative AI restructures students' epistemic relationships with knowledge, particularly in underrepresented African higher education contexts. This study investigates the relationship between ChatGPT use and epistemic dependency among university students in Burundi and Sierra Leone using a sequential explanatory mixed-methods comparative design that integrates survey data from 452 students and qualitative interviews. Findings indicate that increased ChatGPT use is associated with greater algorithmic reliance, declining verification practices, and reduced independent inquiry. Comparative evidence further demonstrates that epistemic dependency remains institutionally contingent rather than technologically uniform. The study advances scholarship on AI-mediated learning by conceptualizing generative AI as an emerging epistemic intermediary influencing knowledge-validation processes within digitally transforming higher education environments.

Keywords: Generative artificial intelligence; ChatGPT; epistemic dependency; African higher education; AI-mediated learning; educational technology; higher education digitalization

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INTRODUCTION

The rapid diffusion of generative artificial intelligence (AI) is reshaping higher education by altering how students access information, develop arguments, solve problems, and engage with academic knowledge (Li et al., 2024). Among these technologies, ChatGPT has become especially influential because it can generate conversational responses, explain concepts, support writing, and assist with information retrieval across disciplinary fields (Bannister et al., 2024; Chandrasekaran & Nair, 2024). Its educational adoption has created opportunities for personalized support and expanded access to learning resources, while also intensifying concerns about academic integrity, cognitive outsourcing, epistemic authority, and unequal technological capacity (Cotton et al., 2024; Duke, 2026; Dwivedi et al., 2023; Kasneci et al., 2023; Tlili et al., 2023). The central issue is therefore no longer whether generative AI is entering universities, but how its routine use is reorganizing the relationship between students, knowledge, and academic judgment.

Generative AI should not be treated as a neutral educational instrument. Sociotechnical scholarship demonstrates that technologies acquire meaning and consequence through the institutional arrangements, pedagogical practices, and epistemic norms within which they are used (Aysan, 2025; Bearman et al., 2023; Lee et al., 2022). ChatGPT may augment learning by reducing barriers to information, providing language and writing support, and clarifying concepts. Yet the same affordances may encourage students to externalize intellectual tasks that higher education ordinarily expects them to perform independently, including identifying credible sources, evaluating competing claims, and constructing reasoned conclusions (Abbas et al., 2026; Wardak, 2026). Educational efficiency may therefore coexist with weakened verification, reduced inquiry, and increasing acceptance of algorithmically produced answers.

This tension can be examined through the concept of epistemic dependency. Social epistemology has long recognized that knowledge is socially distributed and that individuals necessarily rely on the testimony and expertise of others (Goldman, 1999; Hardwig, 1985). Generative AI introduces a distinct form of mediation because an algorithmic system can become an immediate, recurrent, and apparently authoritative source of explanation, validation, and problem-solving. In this study, epistemic dependency refers to a condition in which students increasingly treat AI-generated outputs as primary authorities for acquiring, verifying, and applying academic knowledge. The concept does not equate every use of ChatGPT with dependency. Rather, dependency becomes analytically significant when AI begins to substitute for, rather than supplement, independent inquiry, source verification, and reflective judgment.

These questions are particularly consequential in African higher education. Digital transformation is advancing across the continent, but institutional capacity, connectivity, access to scholarly resources, digital literacy, and pedagogical support remain uneven (Simiyu & Masibo, 2026; UNESCO, 2023; Woldegiorgis, 2026). Such conditions may make generative AI unusually valuable as a low-cost and immediately accessible academic resource. At the same time, they may increase the likelihood that students use AI-generated material in place of inaccessible databases, limited library collections, or insufficient academic support. The effects of ChatGPT can therefore neither be presumed to be universally beneficial nor reduced to individual user choice; they must be examined within the institutional environments that structure learning opportunities and constraints.

Burundi provides a predominantly Francophone higher education context in which public and private institutions operate amid continuing resource, quality-assurance, linguistic, and digital-capacity challenges. The wider education system is being reformed through the national planning framework for 2022–2030, while more recent initiatives have sought to strengthen digital and AI competencies within teaching and learning (UNESCO, 2025; UNESCO IIEP Regional Office for Africa, 2021). Burundi's linguistic environment is particularly relevant to AI-mediated learning. Kirundi remains central to everyday communication and earlier educational experience, whereas French retains an important role in advanced instruction and academic communication. University students may therefore use ChatGPT not only as a source of information but also as a mechanism for translation, conceptual clarification, language support,

and navigation between different linguistic registers. These conditions may encourage forms of AI engagement oriented toward comprehension and academic mediation rather than direct task substitution alone.

Sierra Leone, by contrast, has an Anglophone higher education system undergoing institutional expansion and policy-driven digitalization. Its universities and other tertiary institutions operate under substantial infrastructure, connectivity, and resource constraints, while recent governmental initiatives have emphasized campus internet access, learning-management systems, distance education, and the broader integration of digital tools into tertiary learning (Government of Sierra Leone, 2022; Ministry of Information and Civic Education, 2024). These reforms create growing opportunities for AI-supported education, but they also produce uneven conditions in which technological adoption may advance more rapidly than institutional guidance, access to academic databases, or formal AI-literacy provision. Within this environment, students may employ ChatGPT to manage academic workloads, prepare assignments, improve writing, and compensate for limitations in conventional learning support.

Burundi and Sierra Leone therefore constitute theoretically productive comparative cases. Both represent underexamined African higher education environments experiencing digital transformation under constrained institutional conditions, but they differ in linguistic traditions, educational organization, and pathways of technological integration. This variation permits examination of whether epistemic dependency follows a technologically invariant pattern or emerges through context-specific mechanisms. The comparison is not intended to rank the two higher education systems or treat either as institutionally homogeneous. Rather, it provides analytical leverage for identifying how linguistic conditions, educational infrastructures, resource environments, and institutional expectations shape the functions assigned to ChatGPT and the extent to which AI use complements or displaces independent knowledge practices.

Despite the rapid growth of scholarship on generative AI in higher education, three gaps remain. First, existing research continues to prioritize adoption patterns, academic performance, and integrity concerns while paying comparatively less attention to how generative AI reorganizes students' epistemic relationships with knowledge. This emphasis provides limited insight into whether students continue to evaluate and verify knowledge independently after incorporating ChatGPT into routine academic work. Second, African higher education remains substantially underrepresented in empirical ChatGPT research, limiting the geographical and institutional scope of existing theoretical claims. Third, comparative evidence remains insufficient regarding the mechanisms through which different educational environments condition algorithmic reliance, verification behavior, independent inquiry, and intellectual autonomy. These limitations prevent existing scholarship from determining whether epistemic dependency is a generalized consequence of generative AI or a contextually mediated outcome.

This study addresses these gaps through a sequential explanatory mixed-methods comparison of university students in Burundi and Sierra Leone. It addresses the following research questions:

RQ1: How do university students in Burundi and Sierra Leone use ChatGPT within academic learning processes?

RQ2: How is ChatGPT utilization associated with knowledge-acquisition practices, independent inquiry, verification behavior, and academic autonomy?

RQ3: How do institutional and educational conditions explain variation in epistemic dependency across Burundi and Sierra Leone?

The study makes three contributions. First, it operationalizes epistemic dependency as a multidimensional educational construct involving algorithmic reliance, verification decline, and reduced independent inquiry. This moves analysis beyond generalized concerns about "overreliance" by specifying the observable practices through which dependency develops. Second, the study extends sociotechnical learning theory by demonstrating how institutional, linguistic, and resource conditions mediate the epistemic consequences of generative AI. Third, it contributes comparative evidence from two underrepresented African higher education systems, demonstrating that dependency is neither an automatic consequence of technological exposure nor a uniform individual behavior. Instead, it emerges through

interactions among AI affordances, educational resources, learning practices, digital competencies, and institutional support. Generative AI is thus conceptualized not merely as educational technology, but as an evolving epistemic intermediary whose consequences depend upon the higher education systems into which it is incorporated.

LITERATURE REVIEW

Generative AI and the Transformation of Higher Education Learning Environments

The emergence of generative artificial intelligence (AI), particularly large language model applications such as ChatGPT, has generated extensive debate concerning the organization and purposes of higher education. Early scholarship largely approached ChatGPT as a pedagogical innovation capable of expanding information access, supporting academic writing, generating feedback, and facilitating personalized learning (Dwivedi et al., 2023; Kasneci et al., 2023; Tlili et al., 2023). Systematic reviews indicate that students now use generative AI for brainstorming, summarization, language assistance, tutoring, assessment preparation, research support, and content generation (Baig & Yadegaridehkordi, 2024; Farrokhnia et al., 2024). ChatGPT has therefore moved beyond experimental use to become an increasingly embedded component of higher education learning environments.

Two competing interpretations dominate this literature. The augmentation perspective conceptualizes generative AI as pedagogical infrastructure that supplements students' existing capabilities. ChatGPT can provide rapid explanations, adapt material to different levels of prior knowledge, assist multilingual learners, and support students who encounter difficulties initiating written work or understanding complex concepts (Kasneci et al., 2023; Song & Song, 2023). Studies have accordingly associated ChatGPT use with writing support, conceptual clarification, academic productivity, and student engagement (Farrokhnia et al., 2024; Lingard, 2023; Shaikh et al., 2024). Under appropriately designed pedagogical conditions, generative AI may strengthen learning by providing feedback and cognitive scaffolding without necessarily displacing student agency.

The substitution perspective questions whether these efficiency gains consistently produce deeper learning. ChatGPT can generate immediate and apparently coherent answers without requiring students to undertake the source evaluation, conceptual struggle, iterative reasoning, and evidence synthesis traditionally associated with academic knowledge construction. Sustained reliance may consequently encourage cognitive offloading, weaken independent inquiry, and normalize the delegation of intellectual tasks to automated systems (Gill et al., 2024; Rospigliosi, 2023; Wardak, 2026; Zhai et al., 2024). Hallucinated information, fabricated references, diminished originality, and superficial engagement further complicate claims that faster task completion necessarily represents educational improvement (Farrokhnia et al., 2024; Kasneci et al., 2023).

The educational consequences of generative AI therefore depend less on whether students use it than on the functions it performs within the learning process. ChatGPT operates augmentatively when students use it to clarify concepts, generate questions, compare explanations, or obtain feedback while retaining responsibility for evaluating evidence and constructing conclusions. It becomes substitutive when students delegate problem formulation, source selection, reasoning, verification, and final academic judgment to the system. This functional distinction is important because research measuring adoption frequency, behavioral intention, or satisfaction may not reveal whether generative AI strengthens or displaces the epistemic practices through which higher education develops intellectual autonomy.

Geographic Patterns in Generative AI Research

Evidence from different regions demonstrates that ChatGPT adoption is widespread but institutionally and socially differentiated. A global survey of 23,218 higher education students across 109 countries and territories found that students most frequently used ChatGPT for brainstorming, summarization, research assistance, and academic writing (Ravšelj et al., 2025). Participants valued its

ability to simplify complex information and improve study efficiency but expressed concerns about reliability, plagiarism, privacy, cheating, and the development of critical-thinking skills. Variations across income groups, disciplines, modes of study, and socioeconomic circumstances indicated that the educational meaning of ChatGPT cannot be explained by technological availability alone.

European research has focused primarily on adoption, disciplinary variation, student attitudes, and institutional governance. A survey of 5,894 students across Swedish universities found substantial awareness and use of ChatGPT, together with concern about its implications for learning and assessment (Stöhr et al., 2024). Use and attitudes varied by gender and discipline, with students in engineering and technology reporting more frequent and positive engagement than students in medicine and the humanities. In Poland, habitual use, performance expectancy, and hedonic motivation were significant predictors of students' intentions to adopt ChatGPT (Strzelecki, 2024). These findings demonstrate that even within comparatively well-resourced systems, AI use remains conditioned by disciplinary cultures, technological familiarity, and perceptions of academic utility.

Asian evidence similarly reveals a combination of educational value and institutional uncertainty. In Indonesia, students and academic staff reported using ChatGPT for research, examination preparation, conceptual assistance, and personalized learning, while also expressing concern about plagiarism and unclear institutional regulation (Margono et al., 2024). A survey across five Indonesian universities found that behavioral intention strongly predicted actual ChatGPT use, although motivational and social determinants varied among participants (Habibi et al., 2024). In the Philippines, students and teachers displayed orientations ranging from ethical caution and balanced integration to convenience-driven enthusiasm (Espartinez, 2024). Such variation demonstrates that users operating within the same national system may hold substantially different understandings of the educational legitimacy of generative AI.

Research from Nepal moves more directly toward the question of intellectual autonomy. University students valued ChatGPT for writing and learning support but associated its use with potential declines in creativity, writing development, independent research, and academic integrity (Ghimire et al., 2024). This evidence illustrates that students may experience generative AI simultaneously as a valuable educational resource and as a substitute for capabilities that higher education is intended to cultivate.

Middle Eastern studies have generally emphasized acceptance, educational performance, and academic integrity. Among university students in the United Arab Emirates, ChatGPT use was positively associated with engagement, critical-thinking abilities, and academic achievement (Youssef et al., 2024). Multinational evidence from Arab higher education contexts has likewise documented substantial adoption alongside concerns about accuracy, assessment integrity, and ethical use (Abdaljaleel et al., 2024). However, much of this evidence is cross-sectional and based on self-reported perceptions. Positive evaluations of usefulness therefore cannot establish whether sustained AI engagement preserves independent reasoning or contributes to longer-term dependency.

Three broader trends emerge from this geographically expanding literature. First, students across regions employ ChatGPT for broadly similar immediate functions, including information retrieval, summarization, brainstorming, writing support, and conceptual explanation. Second, patterns of use and perceptions of legitimacy vary according to discipline, language, socioeconomic position, institutional resources, and the availability of formal guidance. Third, existing research remains more developed in measuring acceptance, usefulness, intention, and academic outcomes than in examining changes in verification behavior, informational authority, and independent knowledge construction. Geographic diversification has therefore not yet resolved the epistemic consequences of routine generative AI use.

ChatGPT, Academic Autonomy, and Epistemic Dependency

Academic autonomy encompasses more than completing tasks without assistance. It involves the capacity to formulate questions, evaluate evidence, distinguish credible from unreliable information, and exercise judgment over competing knowledge claims. Generative AI may alter these processes because it does not merely retrieve information. It synthesizes responses, frames problems, selects apparently relevant

material, and provides seemingly complete explanations without consistently revealing the evidentiary processes underlying its outputs (Bearman et al., 2023; Kharipova et al., 2024). Students may therefore become reliant not only on AI-generated content but also on the system's implicit judgments concerning what information is relevant and what constitutes a satisfactory academic answer.

Social epistemology provides an appropriate foundation for analysing this development. Knowledge production has never been wholly individual; learners necessarily depend on teachers, scholarly communities, libraries, peer testimony, and specialized expertise (Goldman, 1999; Hardwig, 1985). Epistemic dependence is therefore not intrinsically undesirable. Higher education itself institutionalizes forms of dependence through peer review, disciplinary methods, source transparency, and opportunities for contestation.

Algorithmic mediation introduces a different form of epistemic relationship because the identity, provenance, and evidentiary foundation of the information may remain opaque. ChatGPT generates probabilistic language outputs from extensive training data but does not consistently distinguish verified knowledge from plausible formulation. Its conversational fluency can consequently produce an appearance of authority that exceeds the reliability of its content (Kasneci et al., 2023; Kharipova et al., 2024). When learners accept such outputs without external evaluation, epistemic authority shifts from transparent academic procedures toward an opaque computational intermediary.

Emerging evidence indicates that frequent generative AI use may reduce source verification, weaken independent information-seeking behavior, and encourage acceptance of generated responses because they appear coherent and immediately useful (Ghimire et al., 2024; Imran & Almusharraf, 2023; Zhai et al., 2024). Nevertheless, students do not constitute a homogeneous category of users. Latent-profile research suggests that some students employ ChatGPT selectively for planning, feedback, or information retrieval, whereas others delegate assignment drafting and broader academic tasks to the system (Stojanov et al., 2024). Dependency should therefore be examined as a differentiated pattern of knowledge behavior rather than inferred automatically from the frequency of technological use.

In this study, epistemic dependency is conceptualized as a condition in which students increasingly rely on generative AI as a primary authority for producing, interpreting, and validating academic knowledge. It comprises three interrelated dimensions. Algorithmic reliance refers to the prioritization of AI-generated responses over other knowledge sources. Independent inquiry reduction captures a declining tendency to investigate questions through scholarly literature or autonomous reasoning. Verification decline concerns the reduced comparison of AI outputs with credible external evidence.

This conceptualization distinguishes dependency from ordinary or intensive technological use. A student may use ChatGPT frequently while maintaining autonomy through systematic verification, comparison with course materials, and independent reconstruction of arguments. Conversely, occasional use may become epistemically consequential when generated outputs are treated as sufficiently authoritative to terminate further inquiry. Epistemic dependency is therefore defined by the reorganization of knowledge practices, not by technological exposure alone.

Generative AI and African Higher Education

The implications of epistemic dependency are particularly significant in African higher education, where generative AI adoption intersects with unequal connectivity, restricted access to scholarly databases, uneven digital competencies, multilingual learning environments, and substantial variation in institutional support. These structural conditions may increase the value of ChatGPT by providing rapid access to explanations and writing assistance. They may also encourage students to substitute AI-generated information for academic resources that are unavailable, unaffordable, or difficult to access (Czerniewicz & Feldman, 2024; UNESCO, 2023). Dependency risks must therefore be interpreted in relation to institutional conditions rather than reduced to individual negligence.

African empirical scholarship is growing but remains geographically concentrated. In Ghana, students demonstrated substantial awareness of ChatGPT and frequent use for academic assignments, while also identifying digital-divide concerns and uncertainty regarding institutional guidance (Baidoo-Anu et al., 2024). An experimental mixed-methods study of Ghanaian undergraduates further showed that structured ChatGPT-supported activities affected critical, creative, and reflective thinking outcomes (Essel et al., 2024). Together, these studies demonstrate both the pedagogical potential of guided AI use and the risks associated with unstructured reliance.

Nigerian research emphasizes the sociocultural and institutional mediation of adoption. Students' engagement with generative AI has been shown to depend on institutional rules, learning practices, technological support, and broader social expectations (Essien et al., 2024). Evidence of demographic variation in the determinants of ChatGPT adoption further reinforces the need to locate AI use within specific educational environments rather than apply universal adoption models (Mohammed et al., 2025).

In South Africa, scholarship has identified opportunities for academic support alongside concerns about fairness, critical capacity, policy uncertainty, and responsible institutional integration (Tarisayi, 2024). Student-focused evidence indicates that AI tools are used across multiple academic functions while universities continue to confront uneven regulation and ethical ambiguity (Muringa, 2025). These findings demonstrate that the effects of generative AI depend partly on whether institutions establish clear expectations regarding verification, attribution, assessment, and legitimate assistance.

Evidence from Zambia similarly illustrates the rapid expansion of generative AI adoption. A multi-institutional study of 1,829 university students found widespread awareness and prior use, with adoption shaped by perceived usefulness, social influence, and perceived risk (Mudenda et al., 2026). Concerns regarding plagiarism, reliability, and limited institutional AI-literacy frameworks nevertheless remained prominent. Collectively, evidence from Ghana, Nigeria, South Africa, and Zambia challenges the assumption that generative AI remains marginal within African universities. Adoption is advancing even where institutional governance and digital infrastructure remain incomplete.

Despite this growth, four limitations characterize the African evidence base. First, empirical research remains concentrated in a small number of countries, while Burundi and Sierra Leone are largely absent. Second, most studies examine awareness, perceptions, acceptance, or behavioral intention rather than epistemic practices. Third, single-country designs dominate, limiting the ability to distinguish general technological patterns from institutionally specific mechanisms. Fourth, few studies combine quantitative relationships with qualitative accounts capable of explaining how reliance develops.

These limitations are theoretically significant because African higher education systems differ in language, infrastructure, institutional development, access to academic resources, and traditions of digital learning. Treating the continent as a homogeneous setting would obscure how these conditions shape the functions students assign to generative AI. Comparative investigation is therefore necessary not only to improve geographical representation but also to identify how context conditions the relationship between AI use and academic autonomy.

Conceptual Framework and Research Gap

The literature demonstrates that generative AI may improve information access, writing support, conceptual explanation, and learning efficiency. It also identifies risks involving factual reliability, academic integrity, cognitive offloading, verification decline, and reduced independent inquiry. However, three connected gaps remain.

First, dominant adoption and acceptance frameworks explain why students use ChatGPT but provide limited insight into how knowledge practices change after adoption. Second, studies concerned with overreliance often treat dependency as a generalized risk without specifying its underlying dimensions or behavioral mechanisms. Third, the geographic expansion of ChatGPT research has not produced sufficient comparative analysis of institutionally differentiated African higher education systems.

The present study addresses these limitations by conceptualizing epistemic dependency as a multidimensional process through which sustained ChatGPT engagement may reorganize informational authority and academic inquiry. As **Figure 1 shows**, ChatGPT utilization intensity is associated with epistemic dependency through algorithmic reliance, declining verification, and reduced independent inquiry. These relationships are not presumed to operate uniformly. Institutional resources, learning cultures, linguistic environments, digital literacy, and access to conventional knowledge infrastructures may condition how AI assistance develops into dependency.

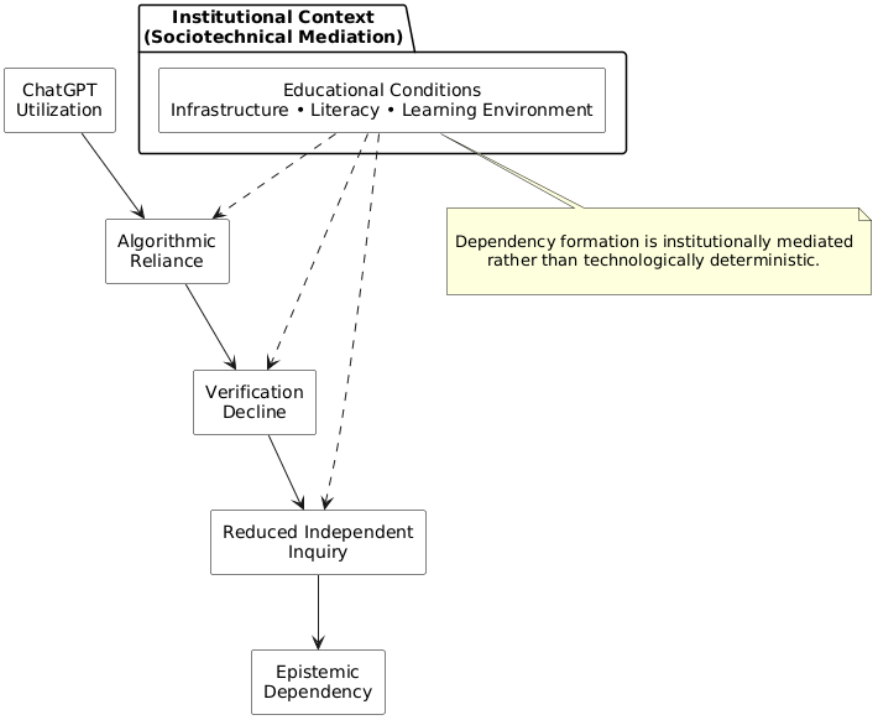


Figure 1. Conceptual Framework of AI-Mediated Epistemic Dependency Formation Across Higher Education Learning Environments

Source: Developed by the authors based on social epistemology (Goldman, 1999; Hardwig, 1985), sociotechnical systems theory (Aysan, 2025), and scholarship on AI-mediated higher education (Dwivedi et al., 2023; Kasneci et al., 2023).

The framework proposes that epistemic dependency arises when generative AI progressively assumes functions otherwise performed through independent inquiry, scholarly verification, and reflective judgment. By comparing Burundi and Sierra Leone, the study examines whether these mechanisms operate consistently across two underrepresented African higher education systems or are conditioned by localized institutional and educational environments. It thereby moves beyond documenting adoption toward explaining how ChatGPT becomes an epistemic intermediary and under what conditions educational assistance may evolve into dependency.

RESEARCH METHOD

Research Design

This study employed a sequential explanatory mixed-methods comparative research design to investigate the relationship between ChatGPT utilization and epistemic dependency among university students in Burundi and Sierra Leone. The mixed-methods approach was theoretically and analytically motivated by the multidimensional nature of epistemic dependency as an emergent educational

phenomenon at the intersection of technological mediation, knowledge production, and learning behavior (Hardwig, 1985). Because epistemic dependency encompasses both measurable behavioral tendencies and contextually embedded educational experiences, neither quantitative nor qualitative methods independently provided sufficient explanatory depth.

The study adopted a two-phase sequential explanatory design following Creswell and Plano Clark (2018), wherein quantitative data collection and analysis preceded qualitative inquiry. The quantitative phase established measurable associations between ChatGPT utilization intensity and epistemic dependency indicators across national contexts, while the qualitative phase generated explanatory insights regarding the mechanisms through which AI-mediated learning practices influenced knowledge acquisition, verification behavior, and intellectual autonomy.

Integration followed a connecting and building strategy characteristic of explanatory mixed-methods designs. Quantitative findings informed qualitative participant selection and interview development, while qualitative evidence was subsequently mobilized to explain statistical relationships observed during quantitative modeling. Joint display integration procedures were further employed during meta-inference development to strengthen interpretive coherence across methodological strands.

The comparative dimension was analytically central rather than merely descriptive. Burundi and Sierra Leone were selected through a most-similar systems comparative design logic because both countries represent understudied African higher education environments experiencing ongoing digital educational transformation while differing across linguistic infrastructures, institutional development trajectories, and technological integration conditions. Comparative analysis enabled examination of whether epistemic dependency emerged consistently across contexts or remained institutionally contingent.

Study Population and Sampling Strategy

The target population comprised undergraduate and postgraduate students enrolled in accredited public and private higher education institutions in Burundi and Sierra Leone who reported prior academic exposure to ChatGPT. The quantitative phase employed multistage stratified purposive sampling. Participating institutions are anonymized to preserve institutional confidentiality, digital learning infrastructure availability, and administrative willingness to facilitate recruitment procedures. Stratification procedures ensured representation across academic level (undergraduate versus postgraduate), disciplinary orientation (social sciences, humanities, natural sciences, engineering, and business), and gender categories.

Participants satisfied four inclusion criteria: (1) current enrollment in an accredited higher education institution; (2) minimum age of eighteen years; (3) prior academic use of ChatGPT; and (4) provision of informed consent. Students without prior ChatGPT exposure were excluded to preserve construct validity regarding AI-mediated epistemic practices. Sample size determination followed statistical power principles for multivariate regression and structural equation modeling procedures. Following Cohen (1992), a minimum sample threshold of approximately 450 participants (225 participants per country) was determined sufficient to achieve statistical power of 0.80 for detecting medium effect sizes at $\alpha = .05$. Oversampling procedures accounted for incomplete responses and participant attrition.

The qualitative phase employed maximum variation purposive sampling. Participants demonstrating differing ChatGPT utilization profiles and dependency tendencies were selected from quantitative respondents to strengthen explanatory variation. Twenty-four semi-structured interviews (12 participants per country) were completed, with recruitment concluding following thematic saturation.'

Instrument Development and Variable Operationalization

The quantitative instrument consisted of a structured questionnaire developed to operationalize epistemic dependency within AI-mediated educational environments. Instrument construction followed a multi-stage development procedure integrating educational technology adoption scholarship, epistemic

cognition literature, and emerging studies examining generative AI in higher education. Construct development occurred through four stages:

1. Literature-derived item generation
2. Expert content validation
3. Pilot refinement
4. Psychometric validation

Initial item generation synthesized indicators derived from educational technology adoption scholarship and epistemic cognition frameworks. Item adaptation procedures ensured contextual alignment with AI-mediated educational environments while preserving conceptual consistency. ChatGPT utilization intensity constituted the independent variable and was operationalized as frequency, breadth, and functional integration of ChatGPT within academic learning activities. Indicators included:

- usage frequency
- academic task substitution tendencies
- AI-supported knowledge acquisition
- educational integration intensity

Epistemic dependency constituted the dependent construct and was operationalized as the extent to which learners progressively depended upon AI-generated outputs as primary authorities for information validation, conceptual understanding, academic reasoning, and educational problem-solving.

The construct incorporated three dimensions:

- algorithmic reliance tendencies
- reduced independent inquiry behavior
- diminished verification practices

Representative measurement items included:

- "I rely upon ChatGPT before consulting academic sources."
- "ChatGPT reduces my need to independently verify information."
- "I increasingly depend on AI-generated responses during academic problem-solving."

Control variables included age, gender, academic level, digital literacy, and national context. All items employed five-point Likert response scales ranging from strongly disagree (1) to strongly agree (5). Content validity assessment involved expert evaluation by specialists in educational technology, higher education research, and digital pedagogy. Expert reviewers assessed conceptual relevance, item clarity, and theoretical alignment. Pilot testing involving thirty participants evaluated response consistency, wording precision, and construct performance prior to full deployment. Construct reliability assessment employed Cronbach's alpha and composite reliability procedures using .70 as minimum acceptability thresholds. Exploratory factor analysis (EFA) informed factor structure identification, followed by confirmatory factor analysis (CFA) to evaluate dimensional stability.

Measurement validity procedures further incorporated:

- Average Variance Extracted (AVE)
- Heterotrait-Monotrait Ratio (HTMT)
- Fornell-Larcker discriminant validity assessment

HTMT values below .85 supported construct distinction.

Data Collection Procedures

Quantitative data collection occurred through institutionally distributed electronic surveys administered using secure online survey platforms. Faculty networks and institutional communication channels facilitated recruitment procedures. Data collection remained open for approximately eight weeks across both national contexts. Following preliminary quantitative analysis, qualitative inquiry proceeded through

semi-structured interviews designed to deepen explanatory understanding regarding emerging statistical relationships.

Interview protocols explored:

- patterns of ChatGPT reliance
- knowledge verification practices
- educational problem-solving processes
- perceived shifts in intellectual autonomy associated with sustained generative AI engagement

Interviews ranged between forty-five and sixty minutes. All interviews were audio-recorded following participant consent and transcribed verbatim for analysis.

Analytical Strategy

Quantitative analyses were conducted using IBM SPSS Statistics Version 29 and AMOS Version 29. Initial analyses involved descriptive statistics characterizing demographic composition and ChatGPT utilization patterns. Independent-samples t-tests and chi-square procedures assessed cross-national variation. Associational relationships between ChatGPT utilization intensity and epistemic dependency dimensions were evaluated using Pearson correlation procedures. Hierarchical multiple regression models estimated predictive relationships while controlling for demographic and contextual variables. Multicollinearity diagnostics employed Variance Inflation Factor (VIF) assessment, with values below 5 indicating acceptable independence between predictors. Structural equation modeling (SEM) estimated latent relationships between ChatGPT utilization behaviors and epistemic dependency dimensions.

Model adequacy assessment incorporated established thresholds:

- Comparative Fit Index (CFI $\geq$ .90)
- Tucker-Lewis Index (TLI $\geq$ .90)
- Root Mean Square Error of Approximation (RMSEA $\leq$ .08)
- Standardized Root Mean Square Residual (SRMR $\leq$ .08)

Standardized residual diagnostics further evaluated model specification adequacy.

Measurement invariance testing across Burundi and Sierra Leone samples assessed:

- configural invariance
- metric invariance
- scalar invariance

Qualitative analysis employed NVivo 14 following Braun and Clarke's (2022) reflexive thematic analysis framework.

Analytical procedures involved:

1. familiarization
2. open coding
3. iterative categorization
4. theme development
5. comparative interpretation
6. reflexive synthesis

Common method bias assessment extended beyond Harman's single-factor procedure through Common Latent Factor (CLF) assessment within CFA procedures and marker variable evaluation to strengthen inferential validity.

Mixed-method integration occurred during meta-inference development using joint display matrices linking quantitative patterns and qualitative explanatory mechanisms. Integration strengthened interpretive validity concerning how AI-mediated learning practices contributed to epistemic dependency formation.

Ethical Considerations

Ethical approval for the study was obtained from the host institution prior to data collection. Participation remained voluntary throughout all phases of the study, and informed consent was

obtained from all participants before survey administration and interview participation. Confidentiality and anonymity were maintained through the removal of identifying information from quantitative responses and qualitative interview transcripts. Given the comparative nature of the study, institutional identities are not disclosed to preserve confidentiality and minimize potential reputational risks. The research team securely stored the data, and only authorized members could access it. The study adhered to established ethical principles governing voluntary participation, participant protection, confidentiality, informed consent, and research integrity throughout the investigation of ChatGPT utilization and epistemic dependency within higher education learning environments.

RESULTS

After screening, 452 valid responses remained after excluding cases exceeding the missing-data threshold (>20%) or showing inconsistent response patterns. The final quantitative sample comprised 226 participants from Burundi and 226 participants from Sierra Leone. Preliminary diagnostics indicated acceptable distributional properties across the study variables. Skewness values ranged from −0.91 to 0.73, while kurtosis values remained within ±2, supporting approximate normality and the use of parametric analytical procedures. **Table 1** presents the demographic composition of the sample by country, including age, gender, academic level, and disciplinary background. Reporting these characteristics is important because demographic and educational variables were subsequently included as controls in the multivariate analyses.

Table 1.
Demographic Characteristics of the Quantitative Sample

Characteristic	Burundi (*n* = 226)	Sierra Leone (*n* = 226)	Total (*N* = 452)
Age, years			
***M* (*SD*)**	23.7 (4.1)	24.6 (4.6)	24.2 (4.4)
Range	18–39	18–42	18–42
Gender, *n* (%)			
Female	118 (52.2)	109 (48.2)	227 (50.2)
Male	105 (46.5)	114 (50.4)	219 (48.5)
Other/prefer not to disclose	3 (1.3)	3 (1.3)	6 (1.3)
Academic level, *n* (%)			
Undergraduate	177 (78.3)	169 (74.8)	346 (76.5)
Postgraduate	49 (21.7)	57 (25.2)	106 (23.5)
Disciplinary background, *n* (%)			
Social sciences	58 (25.7)	61 (27.0)	119 (26.3)
Humanities	42 (18.6)	35 (15.5)	77 (17.0)

Natural sciences	45 (19.9)	42 (18.6)	87 (19.2)
Engineering and technology	38 (16.8)	44 (19.5)	82 (18.1)
Business and management	43 (19.0)	44 (19.5)	87 (19.2)

Note. *M* = mean; *SD* = standard deviation. Values are reported as *n* (%) unless otherwise indicated. Percentages were calculated within each national sample and may not sum to exactly 100% because of rounding.

Source*:* Authors' computation based on survey data (2026).

The demographic profile indicated broadly comparable sample compositions across the two national contexts. Participants had a mean age of 24.2 years (*SD* = 4.4), with ages ranging from 18 to 42 years. The total sample was relatively balanced by gender, comprising 227 women (50.2%), 219 men (48.5%), and six participants (1.3%) who identified with another category or preferred not to disclose their gender. Undergraduate students constituted 76.5% of the sample, while postgraduate students accounted for 23.5%. Participants were also distributed across the five disciplinary categories, with social sciences representing the largest group (26.3%), followed by natural sciences and business and management (19.2% each), engineering and technology (18.1%), and humanities (17.0%). The broadly comparable demographic and disciplinary distributions provided contextual information for the cross-national analysis, while age, gender, academic level, digital literacy, and national context were retained as control variables in the regression models.

Regression diagnostics further indicated that the assumptions underlying the multivariate analyses were adequately satisfied. Variance Inflation Factor values ranged from 1.08 to 1.64, remaining below conventional multicollinearity thresholds, while tolerance values ranged from .61 to .92 across all predictors. Residual diagnostics revealed no substantial departures from linearity or homoscedasticity. Construct reliability and measurement validity were assessed before testing the substantive relationships.

Measurement Model Assessment

Internal consistency reliability exceeded the recommended thresholds across all latent constructs. ChatGPT Utilization Intensity demonstrated α = .88, CR = .90, AVE = .64, with factor loadings ranging from .71 to .86. Algorithmic Reliance demonstrated α = .84, CR = .87, AVE = .58, and loadings from .68 to .82. Independent Inquiry Reduction demonstrated α = .81, CR = .84, AVE = .56, and loadings from .67 to .79. Verification Behavior Decline demonstrated α = .79, CR = .82, AVE = .54, and loadings from .65 to .81. Epistemic Dependency demonstrated α = .91, CR = .93, AVE = .67, and loadings from .74 to .89.

Exploratory factor analysis demonstrated satisfactory sampling and dimensional adequacy. The Kaiser–Meyer–Olkin measure was .89, and Bartlett's test of sphericity was statistically significant, $\chi^2 = 4817.32$, $p < .001$. Factor retention was informed by eigenvalues exceeding 1.0 and inspection of the scree plot. Subsequent confirmatory factor analysis supported the adequacy of the measurement model. Across all constructs, Cronbach's alpha and composite reliability values exceeded .70, Average Variance Extracted estimates exceeded .50, and standardized factor loadings ranged from .65 to .89, supporting internal consistency and convergent validity. Discriminant validity was assessed using the Fornell–Larcker criterion and the Heterotrait–Monotrait Ratio. HTMT estimates remained below .85, indicating adequate distinction among the latent constructs. Common method bias was assessed through multiple procedures rather than reliance on Harman's single-factor test alone. The largest unrotated factor accounted for 28.4% of the total variance and therefore did not dominate the factor structure. Common Latent Factor assessment produced negligible variance inflation, suggesting that common method variance was unlikely to materially distort the estimated relationships.

RQ1: Cross-National Patterns of ChatGPT Utilization

Descriptive analyses demonstrated substantial integration of ChatGPT within both higher education contexts, although the intensity and functional patterns of use differed significantly between the two countries. Independent-samples *t*-tests compared ChatGPT utilization intensity and epistemic dependency dimensions among participants from Burundi and Sierra Leone. Cohen's *d* and confidence intervals were examined to assess the magnitude and precision of the observed differences. **Table 2** presents the cross-national differences across the core study variables.

Table 2.
Cross-Country Differences Across Core Study Variables

Variable	Burundi *M* (*SD*)	Sierra Leone *M* (*SD*)	*t*	*p*	Cohen's *d*	95% CI
ChatGPT Utilization Intensity	3.81 (.72)	4.07 (.68)	−3.94	< .001	.37	[.13, .39]
Algorithmic Reliance	3.29 (.77)	3.63 (.71)	−4.82	< .001	.45	[.20, .48]
Verification Behavior Decline	3.12 (.74)	3.36 (.70)	−3.51	< .001	.33	[.11, .37]
Epistemic Dependency	3.41 (.68)	3.69 (.64)	−4.37	< .001	.42	[.16, .40]

Note. *M* = mean; *SD* = standard deviation; CI = confidence interval. Confidence intervals represent the mean difference between Sierra Leone and Burundi.
Source: Authors' computation based on survey data (2026).

Participants from Sierra Leone reported significantly higher levels of ChatGPT utilization intensity, algorithmic reliance, verification decline, and overall epistemic dependency than participants from Burundi. Effect sizes ranged from small to moderate, indicating substantively meaningful, although not extreme, contextual differences.

Functional utilization patterns provided further evidence of cross-national variation. Sierra Leonean participants reported comparatively greater reliance on ChatGPT for assignment preparation, academic writing, and rapid completion of assessed tasks. Burundian participants more frequently described using ChatGPT for conceptual clarification, translation, and language-related assistance. These findings indicate that generative AI was not incorporated uniformly across the two settings. Instead, its educational role varied according to localized learning needs and institutional conditions.

RQ2: Relationship Between ChatGPT Utilization and Epistemic Dependency

Bivariate analysis demonstrated a statistically significant positive association between ChatGPT utilization intensity and epistemic dependency, $r = .49$, $p < .001$. Greater levels of ChatGPT utilization therefore corresponded with stronger tendencies toward algorithmic reliance, reduced independent inquiry, and declining verification practices.

Hierarchical multiple regression was subsequently conducted to estimate the relationship between ChatGPT utilization intensity and epistemic dependency while controlling for demographic and contextual

characteristics. Model 1 included age, gender, academic level, digital literacy, and country context. Model 2 introduced ChatGPT utilization intensity as the principal explanatory variable. **Table 3** presents the results of the hierarchical regression analysis predicting epistemic dependency.

Table 3.
Hierarchical Regression Predicting Epistemic Dependency

Variable	Model 1 β	Model 2 β	Tolerance	VIF
Age	−.04	−.03	.89	1.12
Gender	.02	.01	.92	1.08
Academic Level	−.08	−.05	.81	1.24
Digital Literacy	−.16**	−.12*	.73	1.37
Country Context	.11*	.08	.69	1.45
ChatGPT Utilization Intensity	—	.46***	.61	1.64

Model 1: Adjusted $R^2 = .07$; $F = 6.41$; $p < .001$
Model 2: Adjusted $R^2 = .29$; $\Delta R^2 = .22$; $F = 26.38$; $p < .001$
Note. β = standardized regression coefficient; VIF = Variance Inflation Factor. Model 1 included demographic and contextual controls. Model 2 additionally included ChatGPT utilization intensity.
$p < .05$. **p** < .01. ***p*** < .001.
Source: Authors' computation based on survey data (2026).

The introduction of ChatGPT utilization intensity substantially improved the explanatory capacity of the model, increasing the adjusted variance explained from .07 to .29. ChatGPT utilization accounted for an additional 22% of the variance in epistemic dependency and emerged as the strongest predictor in the final model, β = .46, $p < .001$. Digital literacy retained a modest negative association with epistemic dependency, suggesting that stronger digital competencies may provide limited protection against uncritical reliance on AI-generated outputs.

Structural Equation Modeling

Structural equation modeling was conducted to assess the relationships between ChatGPT utilization intensity and the latent dimensions of epistemic dependency. The structural model demonstrated satisfactory fit, $\chi^2/df = 2.11$, CFI = .95, TLI = .94, RMSEA = .049, and SRMR = .044. ChatGPT utilization intensity demonstrated statistically significant positive pathways to algorithmic reliance, β = .53, $p < .001$; independent inquiry reduction, β = .38, $p < .001$; and verification behavior decline, β = .31, $p < .001$. Algorithmic reliance exhibited the strongest standardized pathway, indicating that shifts in informational authority constituted the most prominent mechanism connecting sustained AI utilization with epistemic dependency. Indirect-

effect analysis further indicated that verification behavior decline partially mediated the relationship between ChatGPT utilization intensity and epistemic dependency. Dependency formation therefore appeared to operate not only through direct reliance on generative AI but also through the progressive displacement of independent verification practices.

RQ3: Comparative Contextual Dynamics of Epistemic Dependency

Multigroup structural equation modeling was used to assess whether the relationship between ChatGPT utilization and epistemic dependency remained stable across the Burundi and Sierra Leone samples. Measurement invariance analysis supported configural and metric invariance, indicating that the underlying construct structure and factor loadings were sufficiently comparable across the two national groups.

The utilization-to-dependency pathway was stronger among participants from Sierra Leone, $\beta = .57$, $p < .001$, than among participants from Burundi, $\beta = .41$, $p < .001$. This difference indicates that exposure to the same generative AI technology did not produce identical epistemic consequences across the two educational environments. Instead, the relationship between AI utilization and epistemic dependency varied according to contextual conditions, supporting an institutionally contingent rather than technologically deterministic interpretation.

Qualitative Explanatory Findings

Twenty-four semi-structured interviews, comprising 12 participants from each country, were used to explain the mechanisms underlying the quantitative relationships. The qualitative analysis generated three interconnected themes: efficiency-driven algorithmic reliance, progressive externalization of knowledge verification, and the negotiation of intellectual autonomy. Participant accounts also revealed important negative and divergent cases, demonstrating that intensive ChatGPT use did not invariably result in epistemic dependency.

Efficiency-Driven Algorithmic Reliance

Participants frequently described ChatGPT as an efficiency-enhancing resource that reduced the time required to locate information, understand unfamiliar concepts, organize ideas, and begin academic assignments. Efficiency was particularly important where students faced multiple deadlines, limited access to academic materials, or pressure to complete assessed work within short periods. A Sierra Leonean participant explained:

> *"Instead of spending hours finding material, ChatGPT gives direction immediately." (Participant 11, Sierra Leone)*

A second Sierra Leonean participant similarly emphasized the influence of workload pressures:

> *"When several assignments come together, I use it because it is quicker." (Participant 18, Sierra Leone)*

Burundian participants also valued efficiency, although they more frequently framed ChatGPT as a source of conceptual assistance rather than direct task completion. One student observed:

> *"For me, it is mostly a starting point. It explains difficult ideas in simpler words." (Participant 4, Burundi)*

These accounts help explain the quantitative finding that ChatGPT utilization was higher in Sierra Leone while also demonstrating functional differences in how the technology was incorporated. Sierra Leonean students more frequently associated ChatGPT with workload management and

assignment completion, whereas Burundian students commonly described it as a supplementary explanatory resource.

Efficiency motivations therefore appeared to precede dependency formation. Participants did not generally report making a deliberate decision to transfer intellectual responsibility to ChatGPT. Instead, repeated use gradually established the system as a convenient initial point of engagement with academic tasks. Nonetheless, negative cases remained evident. Several intensive users explained that they continued to consult textbooks, journal articles, or lecture materials after using ChatGPT, indicating that technological exposure alone did not uniformly produce dependency.

Progressive Externalization of Knowledge Verification

The second theme concerned changes in how participants evaluated and verified academic information. Several students described moving from verification-first practices, in which conventional academic sources were consulted before forming conclusions, toward AI-first practices in which ChatGPT became the initial and sometimes final source of information. A Burundian participant explained:

> *"Before, I checked journals first. Now sometimes ChatGPT becomes enough." (Participant 6, Burundi)*

A Sierra Leonean participant similarly acknowledged:

> *"If the answer looks clear, I sometimes use it without checking elsewhere." (Participant 15, Sierra Leone)*

These accounts indicated that the fluency and apparent coherence of ChatGPT responses influenced whether students considered additional verification necessary. However, verification decline was not universal. One Burundian participant stated:

> *"I still check important facts, but not every answer." (Participant 9, Burundi)*

This divergent account demonstrates that verification behavior existed along a continuum rather than as a binary distinction between complete reliance and complete independence. Some participants abandoned verification for routine tasks but retained it for complex, controversial, or high-stakes academic claims.

The qualitative findings closely corresponded with the quantitative evidence showing a positive relationship between ChatGPT utilization and verification decline. They also clarified the partial mediation result by identifying a behavioral process through which dependency developed: repeated exposure to rapid and persuasive AI-generated responses reduced the perceived necessity of consulting independent academic sources. Verification externalization therefore emerged as a central mechanism connecting technological convenience with epistemic dependency.

Negotiating Intellectual Autonomy

The third theme captured participants' attempts to balance the educational benefits of ChatGPT against concerns about independent thinking, personal effort, and depth of learning. Participants commonly recognized that ChatGPT could improve productivity while simultaneously reducing the intellectual effort required to formulate arguments, solve problems, or evaluate evidence. A Sierra Leonean participant stated:

"It improves learning but also changes how much effort students invest themselves." (Participant 19, Sierra Leone)

Another Sierra Leonean participant described becoming increasingly aware of the displacement of independent reasoning:

"Sometimes I notice that I ask ChatGPT before thinking through the question." (Participant 22, Sierra Leone)

Nevertheless, participants also described deliberate practices through which they attempted to preserve intellectual ownership. A Burundian participant explained:

"I use it for ideas, but I try to write the final answer myself." (Participant 8, Burundi)

These accounts demonstrate that intellectual autonomy was not simply lost as ChatGPT use increased. Rather, it was actively negotiated through students' decisions about when to consult AI, whether to verify its responses, and how extensively to incorporate generated material into their academic work. Some participants attempted to preserve autonomy by rewriting AI-generated material, comparing responses with course readings, or using ChatGPT only after independently attempting a task.

The presence of these resistant practices further explains why the utilization-to-dependency relationship differed across participants and national contexts. Individual learning habits, digital literacy, pedagogical expectations, access to conventional academic resources, and institutional guidance appeared to moderate whether ChatGPT functioned as a supplementary learning tool or became a substitute for independent inquiry.

Integrated Mixed-Methods Meta-Inference

Integration of the quantitative and qualitative findings demonstrated substantial convergence across the two methodological strands. Quantitative analyses established that ChatGPT utilization intensity was significantly associated with epistemic dependency and its constituent dimensions. The qualitative findings explained how these relationships developed through efficiency-oriented reliance, reduced verification, and the gradual repositioning of ChatGPT as an informational authority.

The higher utilization and dependency estimates observed among Sierra Leonean participants were reflected in interview accounts emphasizing workload pressures, assignment completion, and the use of ChatGPT as an immediate academic starting point. The mediation of the utilization–dependency relationship through verification decline was similarly supported by participants' descriptions of accepting plausible AI-generated answers without routinely consulting external sources.

At the same time, qualitative negative cases qualified any technologically deterministic interpretation. Some participants reported high levels of ChatGPT use while maintaining independent verification routines and clear boundaries between AI assistance and personal academic work. The integrated findings therefore indicate that epistemic dependency did not arise from technological exposure alone. It emerged through the interaction of AI affordances with localized educational conditions, resource environments, individual competencies, and established learning practices.

Taken together, the findings demonstrate that generative AI increasingly functions not merely as an educational tool but as an epistemic intermediary capable of reshaping how students

initiate inquiry, evaluate information, and determine the authority of knowledge. However, the extent of this transformation remains institutionally and behaviorally contingent rather than universal.

DISCUSSION

This study examined the relationship between ChatGPT use and epistemic dependency in African higher education through a comparative analysis of Burundi and Sierra Leone. Drawing upon a sequential explanatory mixed-methods design, the findings reveal three principal patterns. First, ChatGPT has become substantively embedded within students' academic learning processes across both national contexts. Second, increased ChatGPT utilization demonstrates a significant positive association with epistemic dependency indicators, including heightened algorithmic reliance, declining independent verification practices, and reduced autonomous inquiry behaviors. Third, dependency formation does not emerge uniformly but instead appears institutionally mediated, with cross-national variation indicating that technological integration interacts with localized educational infrastructures and learning conditions.

These findings contribute to growing scholarship arguing that generative artificial intelligence is not merely transforming information accessibility but increasingly restructuring educational knowledge practices (Kasneci et al., 2023; Dwivedi et al., 2023). Existing educational technology scholarship has predominantly conceptualized generative AI as a productivity-enhancing infrastructure capable of improving learning efficiency, facilitating academic writing, and expanding educational accessibility (Tlili et al., 2023; Farrokhnia et al., 2024). The present findings partially support these perspectives. Students across both contexts consistently described ChatGPT as reducing informational search burdens, accelerating assignment completion, and facilitating conceptual understanding. These findings reinforce growing evidence suggesting that generative AI increasingly functions as embedded educational infrastructure rather than merely supplementary educational technology.

However, the findings simultaneously extend existing scholarship by demonstrating that efficiency gains may coexist alongside emerging epistemic vulnerabilities. While prior scholarship documents concerns regarding excessive AI reliance and diminished critical engagement (Gill et al., 2024; Rudolph & Tan, 2023), comparatively limited empirical evidence has examined how such processes contribute to dependency formation. The present findings suggest that sustained engagement with generative AI may progressively reposition algorithmic systems as central epistemic authorities within educational environments, reshaping how students validate information, initiate inquiry processes, and negotiate intellectual autonomy.

Importantly, the findings do not suggest that technological assistance necessarily produces educational harm. Rather, reliance becomes analytically significant when AI-generated informational outputs increasingly substitute rather than complement independent inquiry processes. Interview evidence demonstrated that participants frequently initiated academic problem-solving through ChatGPT before engaging scholarly literature or independent verification mechanisms, while quantitative analyses identified statistically significant associations linking utilization intensity with verification decline and inquiry reduction. Collectively, these findings suggest movement from informational augmentation toward algorithmically mediated knowledge dependence.

The findings further contribute to debates concerning epistemic authority within AI-mediated educational systems. Historically, higher education knowledge production has operated through distributed epistemic architectures involving instructor guidance, peer interaction, scholarly literature engagement, and independent reasoning processes. Generative AI introduces alternative informational architectures by concentrating informational mediation within algorithmically generated systems. Epistemic dependency therefore emerges not solely through increased technology utilization but through transformations in informational legitimacy structures governing how learners determine evidence quality, validate knowledge claims, and construct academic understanding.

Importantly, alternative explanations also warrant consideration. Dependency patterns observed within the present findings may not emerge exclusively through technological exposure. Educational infrastructure limitations, institutional pedagogical environments, and differential digital literacy capacities may independently influence patterns of algorithmic reliance. Students operating within resource-constrained learning environments may engage generative AI not because of technological dependence itself but because institutional conditions incentivize efficiency-oriented learning strategies. Similarly, lower verification practices may partially reflect digital evaluation competencies rather than dependency formation alone. The present findings therefore support a mediated rather than technologically deterministic interpretation, recognizing that AI-mediated educational consequences emerge through interaction between technological systems and institutional environments.

This interpretation aligns closely with sociotechnical systems scholarship emphasizing that technological effects cannot be analytically separated from social institutions, organizational structures, and contextual learning ecologies (Aysan, 2025). Sociotechnical theory suggests that educational technologies operate through institutional mediation mechanisms rather than producing uniform consequences across contexts. Technological infrastructures influence educational practices, but institutional learning norms, resource environments, pedagogical cultures, and digital capacity structures condition how technological effects materialize.

The comparative findings strongly support this sociotechnical interpretation. Participants from Sierra Leone demonstrated comparatively stronger utilization-dependency relationships relative to participants from Burundi, suggesting that epistemic dependency formation remains contextually contingent rather than technologically invariant. Linguistic environments, institutional learning structures, infrastructure conditions, and educational support systems likely shape how students negotiate AI-mediated learning practices. Dependency formation therefore appears institutionally mediated rather than universally determined.

The findings additionally contribute to broader discussions concerning educational inequality and digital transformation within historically underrepresented higher education systems. Existing AI-in-education scholarship remains heavily concentrated within higher-income educational environments, generating substantial empirical asymmetries concerning how educational transformation unfolds across lower-resourced systems. By centering Burundi and Sierra Leone, the study extends emerging scholarship examining technological transformation within Global South educational contexts.

The findings further complicate dominant narratives portraying generative AI primarily as democratizing educational infrastructure. Although ChatGPT may improve informational accessibility, accessibility alone does not necessarily strengthen intellectual autonomy. Increased informational accessibility may coexist alongside declining verification practices and heightened algorithmic reliance. Educational equity discussions surrounding artificial intelligence therefore require movement beyond access-centered frameworks toward examination of how AI reshapes intellectual agency, epistemic authority structures, and knowledge production processes.

Theoretical Contributions

The study advances scholarship through three principal theoretical contributions.

First, the study contributes construct development by conceptualizing epistemic dependency as an empirically observable educational phenomenon operating within AI-mediated learning environments (Hardwig, 1985). Existing discussions concerning AI reliance frequently remain conceptually diffuse or narrowly confined to academic integrity concerns. The present findings advance construct specification by demonstrating measurable relationships linking ChatGPT utilization intensity with verification decline, algorithmic reliance tendencies, and reductions in autonomous inquiry behavior.

Second, the study develops a contextual contingency mechanism demonstrating that dependency formation remains institutionally mediated rather than technologically universal (Spasojević-Brkić & Mihajlović, 2023). Comparative findings suggest that educational conditions shape how AI-mediated

learning practices translate into dependency outcomes, extending sociotechnical learning scholarship beyond technologically deterministic assumptions.

Third, the findings advance understanding of generative AI as an evolving epistemic intermediary rather than merely educational infrastructure. ChatGPT increasingly functions not only as informational technology but also as an intermediary shaping informational authority, verification behavior, and knowledge validation practices within contemporary higher education environments.

Practically, the findings carry implications for higher education institutions seeking responsible AI integration strategies. Institutional responses focused exclusively upon restriction or detection mechanisms may prove insufficient. Higher education institutions may require pedagogical interventions emphasizing verification competencies, AI literacy development, and critical algorithmic evaluation capacities. Strengthening students' ability to interrogate AI-generated information critically may reduce dependency risks while preserving educational benefits associated with generative technologies.

Policy implications similarly emerge. Higher education governance frameworks increasingly require institutional guidance mechanisms addressing responsible AI integration. Educational policymakers should consider embedding AI competency development alongside broader digital transformation strategies, particularly within resource-constrained higher education systems where technological integration may outpace institutional support capacity.

Limitations and Future Research

Several limitations warrant consideration. First, the cross-sectional design constrains causal inference regarding long-term dependency development processes. Epistemic dependency may evolve dynamically over time, necessitating longitudinal investigation. Second, reliance upon self-reported AI utilization measures introduces potential recall bias and social desirability effects despite procedural safeguards addressing measurement validity. Third, cross-cultural equivalence challenges warrant recognition. Although Burundi and Sierra Leone provide analytically valuable comparative environments, institutional heterogeneity, linguistic variation, and educational structural differences may influence interpretive comparability. Fourth, epistemic dependency remains an emerging construct requiring further conceptual refinement and external validation across diverse educational contexts. Although the present study advances construct operationalization, future scholarship should continue refining dimensional specification and psychometric evaluation.

These limitations generate several opportunities for future research. Longitudinal studies examining dependency trajectories would strengthen causal understanding. Experimental intervention research examining mechanisms that strengthen verification behavior and intellectual autonomy would further strengthen educational practice implications. Comparative expansion across additional African educational contexts would improve understanding regarding institutional mechanisms shaping AI-mediated epistemic transformation. Future scholarship may additionally investigate disciplinary differences, linguistic influences, and variation across educational levels.

The findings suggest that generative artificial intelligence introduces transformations beyond technological efficiency gains. ChatGPT increasingly operates as an epistemic intermediary within higher education learning environments, reshaping informational authority structures, knowledge validation practices, and processes of intellectual autonomy. Understanding these transformations becomes increasingly important as artificial intelligence becomes progressively embedded within contemporary higher education systems.

CONCLUSION

This study examined the relationship between ChatGPT utilization and epistemic dependency within African higher education through a comparative investigation of university students in Burundi and Sierra Leone. Motivated by growing concerns about how generative artificial intelligence is reshaping

educational knowledge practices, the study moved beyond dominant technology-adoption narratives by examining whether sustained engagement with AI-mediated learning systems influences students' epistemic relationships with knowledge acquisition, verification processes, and academic autonomy. Employing a sequential explanatory mixed-methods comparative design integrating quantitative modeling and qualitative inquiry, the study examined patterns of ChatGPT utilization and the mechanisms through which dependency dynamics emerge across distinct higher education environments.

The findings demonstrate that ChatGPT has become increasingly embedded within students' academic learning practices across both national contexts. More importantly, the evidence indicates that increased engagement with generative AI is significantly associated with heightened epistemic dependency tendencies, particularly through greater algorithmic reliance, declining verification practices, and shifts in independent inquiry behaviors. Comparative findings further demonstrate that these dynamics do not emerge uniformly but remain shaped by localized educational conditions, suggesting that AI-mediated learning outcomes are institutionally contingent rather than technologically predetermined.

The study contributes to contemporary scholarship in three important respects. First, it advances understanding of AI-mediated learning by demonstrating that generative artificial intelligence increasingly operates not solely as educational technology but also as epistemic infrastructure capable of reshaping how students construct, validate, and engage knowledge. Second, the study contributes comparative empirical evidence from African higher education systems that remain substantially underrepresented within contemporary generative AI scholarship. Third, by operationalizing epistemic dependency as an analytically measurable educational construct, the study establishes a conceptual foundation for future inquiry examining how artificial intelligence influences intellectual autonomy within digitally transforming learning environments.

The findings further suggest that responsible artificial intelligence integration within higher education requires movement beyond access-centered and productivity-oriented frameworks toward broader consideration of epistemic authority, verification practices, and educational agency. Institutional responses focused exclusively upon technological adoption may prove insufficient if educational systems do not simultaneously strengthen AI literacy, critical evaluation competencies, and mechanisms supporting independent inquiry.

Generative artificial intelligence increasingly functions not solely as educational technology but as epistemic infrastructure capable of reshaping informational authority, knowledge validation processes, and intellectual autonomy within higher education systems. Future higher education governance will therefore depend not merely upon technological adoption capacity but upon institutions' ability to preserve intellectual autonomy within increasingly algorithmically mediated knowledge environments.

Artificial Intelligence (AI) Use Statement

Artificial intelligence (AI)-assisted tools were used in a limited capacity to support language refinement, writing clarity, and manuscript organization during manuscript preparation. AI tools were not used to generate research data, conduct analyses, or interpret findings. All conceptual development, methodological decisions, and final scholarly judgments remain the sole responsibility of the authors.

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The data supporting the findings of this study are available from the corresponding author upon

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