Students' AI Usage Patterns and Perceived Pedagogical Role in Higher Education: Evidence from the Muslim University of Morogoro, Tanzania

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ABSTRACT

Purpose*:* This study examined undergraduate students' AI usage patterns and their perceptions of AI's pedagogical role in higher education at the Muslim University of Morogoro, Tanzania. It also examined whether selected usage indicators were associated with students' perceived pedagogical role.

Methodology*:* A quantitative cross-sectional descriptive design was employed. Data were collected from 424 undergraduate students through an online questionnaire and analyzed using SPSS. Frequencies and percentages summarized AI usage patterns, while means and standard deviations described students' perceptions. Spearman's rank-order correlations and multiple linear regression were used to examine associations between selected AI usage indicators and the overall perceived pedagogical role.

Contribution to Theory*:* Informed by the Technology Acceptance Model (TAM) and Constructivist Learning Theory, the study adds context-specific evidence from a Tanzanian university. The three usage indicators included in the inferential analyses—frequency of AI use, experience with AI, and self-rated AI proficiency—were not statistically significantly associated with students' perceived pedagogical role in this sample.

Findings and Recommendations*:* Most students (90.57%) reported using AI frequently, either daily or several times a week. ChatGPT was the most commonly reported tool (74.53%), and smartphones were the primary device for 93.16% of respondents. Students rated AI's perceived pedagogical role as moderate overall ($M = 3.35$, $SD = 1.04$), with learning support receiving the highest dimension mean and learner autonomy the lowest. The regression model was not statistically significant, $F(3, 420) = 0.039$, $p = .990$, and explained virtually none of the variance. The study recommends AI literacy, purposeful pedagogical integration, support for learner autonomy, reliable internet access, and clear responsible-use guidance.

Keywords*:* Artificial Intelligence (AI); AI Usage Patterns; Perceived Pedagogical Role; Higher Education; Tanzania.

INTRODUCTION

The advent of artificial intelligence (AI) has shifted higher education institutions worldwide from conventional digital learning strategies toward AI-supported learning environments (Crompton & Burke, 2023; Zawacki-Richter et al., 2019). This transformation is associated with AI's potential pedagogical role in supporting teaching and learning (Luo et al., 2025; Msambwa et al., 2025). Lecturers and students increasingly use AI tools such as ChatGPT, Gemini, Copilot, and other intelligent learning applications to facilitate teaching and learning activities, while universities and colleges employ AI to support institutional management processes (Faraon et al., 2025; Singh et al., 2025). AI functions across teaching, learning, assessment, administration, research, and academic prediction rather than serving as a single classroom-based technology (Crompton & Burke, 2023; Hooda et al., 2022).

In the United States, recent evidence indicates that AI use has become common among college students. A 2026 Gallup–Lumina Foundation report found that 57% of students used AI in their coursework daily or weekly

(Gallup & Lumina Foundation, 2026), while a survey at a selective U.S. college found that more than 80% of students had used AI academically within two years of ChatGPT's release (Contractor & Reyes, 2025). In Europe and North America, studies emphasize AI's pedagogical opportunities, student adoption, and institutional uncertainties rather than uniform adoption rates (Busch et al., 2024; Faraon et al., 2025). Across Asia, studies report varied patterns of AI adoption, including frequent AI-assisted learning among Chinese medical students and substantial student use in Indonesia and Tajikistan (Dushenkov et al., 2026; Shi et al., 2026).

However, evidence from Africa is growing but remains relatively limited compared with other regions. Studies from African higher education contexts report student use of AI applications, particularly for academic writing, literature searching, language support, and learning assistance (Falebita & Kok, 2025; Mollel, 2025). Evidence from Tanzania suggests that AI adoption is an emerging topic in higher education (Baynit et al., 2025; Mollel, 2025). A bibliometric analysis of 105 publications on AI in African higher education identified a sharp increase in research since 2023 and highlighted gaps in ethical and policy-focused work (Oguntona & Emere, 2025). These developments sit alongside continuing concerns about academic integrity and responsible implementation (Crompton & Burke, 2023; Luo et al., 2025).

Studies also indicate that higher learning students commonly use smartphones and laptops to access AI applications such as ChatGPT, Gemini, and Canva AI (Mollel, 2025; Shishakly, 2025; Von Garrel & Mayer, 2023). Despite their growing experience with these AI tools, limited guidance on their appropriate use continues to create ethical challenges, particularly regarding academic integrity (Busch et al., 2024; Kelly et al., 2023; Medina-Gual & Parejo, 2025). In many African countries, students continue to face challenges related to the high cost and unreliable availability of internet connectivity (Medina-Gual & Parejo, 2025; Mollel, 2025). Nevertheless, AI usage in higher learning institutions is increasing rapidly because of its pedagogical role in supporting learning through idea generation, facilitating personalized learning, enhancing learning engagement, and promoting learner autonomy in both institutional and remote learning contexts (Achuthan, 2025; Du Plooy et al., 2024; Guo et al., 2025).

In Tanzania, studies indicate that AI adoption is increasing but remains uneven, with use concentrated mainly in academic writing, idea generation, computing, and personalized learning support (Mollel, 2025). The most frequently used AI applications include ChatGPT (85.7%), QuillBot (41.1%), and Grammarly (11.8%), which are primarily used for writing assignments (47.5%) and generating or brainstorming ideas (38.2%) (Mollel, 2025). Despite growing use of AI tools, concerns remain about digital infrastructure, privacy, and academic integrity (Mollel, 2025). Furthermore, although AI research is expanding, studies examining students' AI usage patterns and its pedagogical role remain limited. Existing studies indicate a need for more institution-specific evidence on undergraduate AI use across academic disciplines (Jereb & Urh, 2024). Therefore, a case study at the Muslim University of Morogoro is warranted to provide empirical evidence on students' AI usage patterns and their perceived pedagogical role within a Tanzanian higher education context.

Statement of the Problem

Recent studies show that AI usage among higher learning students is expanding faster than institutional understanding of why students use these technologies and what consequences may emerge in academic contexts, particularly regarding academic integrity and ethical practices (Isaifan, 2026; Orsava et al., 2026; Stone, 2024). A recent cross-national undergraduate survey indicates that student AI adoption has already reached substantial levels across diverse contexts, including 84.3% in Indonesia, 67.7% in Tajikistan, and 47.2% in the United States (Dushenkov et al., 2026). Despite this widespread adoption, most existing studies emphasize general AI adoption trends rather than institution-specific AI usage patterns and their pedagogical roles in higher learning institutions. Consequently, limited empirical evidence is available to guide curriculum developers, pedagogical practices, and institutional policies regarding effective AI integration (Isaifan, 2026; Jereb & Urh, 2024; Orsava et al., 2026).

The pedagogical role of AI has been widely recognized in the literature, demonstrating its potential to support personalized learning through adaptive systems and tailored learning pathways (Msambwa et al., 2025; Peng & Li, 2025), supported learning through feedback, tutoring, and resource recommendations (Lan & Zhou, 2025; Long et al., 2026), learning engagement through interactive pedagogical approaches (Long et al., 2026), and

learner autonomy through self-regulated learning support (Lan & Zhou, 2025; Peng & Li, 2025). However, much of the existing evidence originates from Western countries, Asia, and selected African contexts, while empirical evidence from Tanzania remains limited and uneven across these pedagogical dimensions. Therefore, this study aims to address this gap by examining undergraduate students' AI usage patterns and perceived pedagogical roles within the Tanzanian higher education context, specifically at the Muslim University of Morogoro.

THEORETICAL FRAMEWORK

This study is guided by two complementary theories: the Technology Acceptance Model (TAM) and Constructivist Learning Theory. The Technology Acceptance Model (TAM), developed by Davis (1989), explains that the successful adoption of technologies such as artificial intelligence (AI) depends largely on users' perceptions of ease of use and usefulness, which influence their acceptance and use of the technology (Baynit et al., 2025; Mustofa et al., 2025; Tbaishat et al., 2026). In this study, students' AI usage patterns, including frequency of AI use, types of AI applications used, usage experience, and AI proficiency, may reflect their perceptions of the ease of use and pedagogical usefulness of AI technologies (Davis, 1989; Mustofa et al., 2025; Tbaishat et al., 2026).

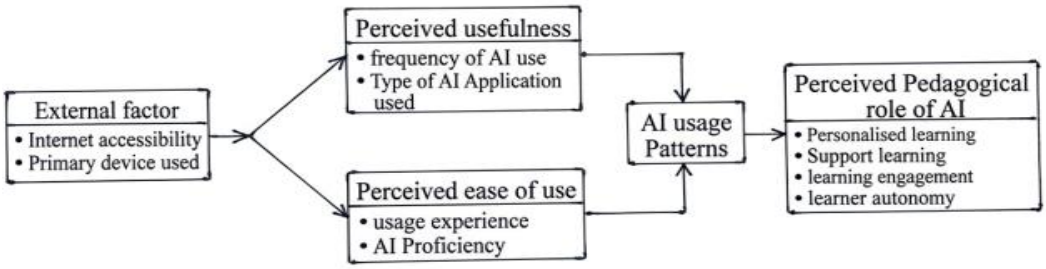
Constructivist Learning Theory, associated with Jean Piaget, explains that learners actively construct knowledge through interaction with their learning environment rather than through passive information delivery (Chen et al., 2020; Popenici & Kerr, 2017). In this study, AI is viewed as an interactive learning tool that supports AI's pedagogical role in facilitating personalized learning, supported learning, learning engagement, and learner autonomy through interactive feedback, adaptive resources, and independent learning opportunities (Chen et al., 2020; Popenici & Kerr, 2017). Therefore, the Technology Acceptance Model and Constructivist Learning Theory provide complementary theoretical foundations for examining students' AI usage patterns and the pedagogical role of AI in higher learning institutions, with particular reference to the Muslim University of Morogoro, Tanzania.

CONCEPTUAL FRAMEWORK

The conceptual framework integrates the Technology Acceptance Model (TAM) and Constructivist Learning Theory to explain how students' AI usage patterns relate to their perceived pedagogical role of AI in higher education. External conditions, including internet accessibility and primary devices, form part of the context in which students access AI tools. AI usage patterns represent students' interactions with and use of AI in learning processes. Guided by Constructivist Learning Theory, the framework considers how AI-supported interactions may be perceived as supporting personalized learning, learning support, learning engagement, and learner autonomy. In this study, these dimensions are measured through students' self-reported perceptions rather than direct measures of learning gains.

Figure 1

Conceptual Framework of AI Usage Patterns and Perceived Pedagogical Role



Study Objectives

The general objective of this study was to examine undergraduate students' AI usage patterns and their perceived pedagogical role of AI in higher education at the Muslim University of Morogoro, Tanzania. The study was guided by the following specific objectives:

a) To assess undergraduate students' AI usage patterns in higher education at the Muslim University of Morogoro, Tanzania.

b) To examine undergraduate students' perceptions of the pedagogical role of AI in higher education at the Muslim University of Morogoro, Tanzania.

c) To examine the relationship between undergraduate students' AI usage patterns and their perceived pedagogical role of AI in higher education at the Muslim University of Morogoro, Tanzania.

Research Questions

The study was guided by the following research questions:

a) What are the AI usage patterns among undergraduate students at the Muslim University of Morogoro, Tanzania?

b) How do undergraduate students perceive the pedagogical role of AI in higher education at the Muslim University of Morogoro, Tanzania?

c) What relationship exists between undergraduate students' AI usage patterns and their perceived pedagogical role of AI in higher education at the Muslim University of Morogoro, Tanzania?

Significance of the Study

This study contributes to the growing literature on artificial intelligence (AI) in higher education by providing empirical evidence on undergraduate students' AI usage patterns and their perceived pedagogical role within a Tanzanian university context. The findings offer practical implications for academic staff and curriculum developers by informing the development of AI-supported teaching strategies, assessment approaches, and learning practices that promote meaningful, personalized, and responsible AI use.

The study also contributes theoretically by extending understanding of technology adoption and constructivist perspectives in a sub-Saharan African higher education setting, particularly by examining the relationship between students' AI usage behaviours and perceived educational benefits of AI. Furthermore, the findings provide policy-relevant insights for university leaders and educational policymakers in developing responsible AI integration frameworks, including ethical guidelines, AI literacy initiatives, and institutional support mechanisms. By addressing the limited empirical evidence from African higher education contexts, this study establishes a foundation for future research on AI adoption, digital transformation, and technology-enhanced learning.

LITERATURE REVIEW

The Concept of AI

In higher education, artificial intelligence (AI) is a soft technology that enables machines to simulate human-like cognitive functions, including learning, reasoning, automated inferences, continuous adaptation, and decision-making (Dahri et al., 2024; Faraon et al., 2025; Hooda et al., 2022). It is a computer-based system that serves as an interactive technology supporting instructional delivery, academic assessment, automated feedback, and decision-support mechanisms (Falebita & Kok, 2025; Faraon et al., 2025; Singh et al., 2025). It is treated theoretically as part of human–AI hybrid intelligence, where artificial tools externalize, extend, and restructure human cognitive workflows and study trajectories (Guardia-Paniura et al., 2026).

When AI is embedded in educational structures, it forms an AI-supported learning environment (AI-SLE), an educational ecosystem in which intelligent software applications support tutoring, assessment, feedback, prediction, and recommendations (Crompton & Burke, 2023; Luo et al., 2025). The literature identifies four primary dimensions of AI-supported learning environments: adaptive learning environments, virtual and

immersive learning environments, self-regulated learning environments, and collaborative learning environments. These dimensions are summarized in Table 1.

Table 1

Dimension Summary of AI-Supported Learning Environments (AI-SLEs)

Self-Regulated Learning (SRL) Environment	Via AI-driven visual analytics dashboards, conversational agents, and adaptive feedback, assists learners in planning, progress tracking, cognitive reflection, and self-evaluation for sustainable study habits.	Falebita & Kok (2025); Guardia-Paniura et al. (2026); Smerdon (2024)
Collaborative Learning Environment	Uses AI-enabled platforms that facilitate teamwork, peer integration, group formation, and knowledge sharing for joint problem-solving and co-construction of knowledge.	Kovari (2025); Luo et al. (2025); Msambwa et al. (2025)

AI Usage Trends and Patterns in Higher Education

According to the literature, AI adoption in higher learning institutions has increased rapidly since 2019. A systematic review of 138 higher education studies found a 150% increase since 2020 relative to the prior two years, and publications in 2021 to 2022 were nearly two to three times early levels (Crompton & Burke, 2023). Another bibliometric analysis of 1,476 articles found exponential growth from 2019 to mid-2024, with thematic attention shifting strongly toward ChatGPT and generative AI by 2023 to 2024 (Corzo-Zavaleta et al., 2025).

At a selective U.S. college, more than 80% of students reported academic AI use within two years of ChatGPT's release (Contractor & Reyes, 2025). In Syria, 86.8% of pharmacy students reported using AI for academic purposes (Alajlani et al., 2026). Published studies report substantial use of AI tools for academic writing, information retrieval, programming, summarization, and learning support, although reported rates vary by population, country, and study design (Crompton & Burke, 2023; Von Garrel & Mayer, 2023), as summarized in Table 2. However, adoption varies across regions due to differences in digital infrastructure, AI literacy, and institutional support (Dahri et al., 2024; Mollel, 2025).

Table 2

Regional Evidence of AI Adoption and Usage in Higher Learning Institutions

Region	**Evidence of AI Adoption and Usage Trends**
North America (USA)	At a selective college, over 80% of students reported academic AI use within two years of ChatGPT's release (Contractor & Reyes, 2025); nationally, 57% of college students reported using AI in coursework daily or weekly (Gallup & Lumina Foundation, 2026).
Europe	A cross-national survey examined students' intentions to use ChatGPT across Nordic countries and the United States (Faraon et al., 2025). A study in Croatia reported university students' use of ChatGPT for writing (Črček & Patekar, 2023).
Asia	A 2026 survey of Chinese medical students found average AI-assisted learning frequency of 5.06 times per week, with over 90% using more than two AI tools (Shi et al., 2026). Student AI use was also substantial in Indonesia and Tajikistan (Dushenkov et al., 2026).
Africa	Tanzanian students report using ChatGPT, QuillBot, and Grammarly for academic writing and idea generation (Mollel, 2025). In a 2026 multi-institutional study in Zambia, 96.8% of students had heard of ChatGPT and 85.6% reported having used it (Mudenda et al., 2026).

In assessing AI usage patterns, studies indicate that students' AI usage increases when AI is integrated into coursework and becomes part of their regular academic practices (Faraon et al., 2025; Mollel, 2025). ChatGPT, QuillBot, Grammarly, and other AI-powered writing support systems are the most frequently used applications (Mollel, 2025; Shishakly, 2025; Von Garrel & Mayer, 2023). However, students' AI experiences remain uneven due to differences in AI literacy, skills, and confidence (Busch et al., 2024; Kelly et al., 2023; Medina-Gual & Parejo, 2025). Furthermore, limited institutional training, policies, and curriculum support continue to constrain effective and responsible AI use (Busch et al., 2024; Medina-Gual & Parejo, 2025; Mollel, 2025).

Pedagogical Role of AI in Higher Education

In the teaching and learning process, AI plays a vital role through personalized learning and supported learning (Du Plooy et al., 2024; Luo et al., 2025). AI-supported personalization can adapt instructional experiences to students' needs, while adaptive feedback may help clarify concepts and support learning. However, reported outcomes depend on the design of the intervention and the learning context (Du Plooy et al., 2024; Naseer & Khawaja, 2025; Yin et al., 2024).

Synthesis and Research Gap

Although the literature reports increasing AI adoption among university students worldwide (Contractor & Reyes, 2025; Crompton & Burke, 2023; Mollel, 2025), three gaps remain relevant to developing higher education contexts. First, evidence on students' AI usage patterns, including frequency and tool preferences, remains limited. Second, more context-specific evidence is needed on students' perceptions of AI across personalized learning, learning support, engagement, and learner autonomy. Third, limited empirical evidence explains whether students' usage patterns are associated with their perceived pedagogical role of AI in Tanzanian higher education. This study addresses these gaps using evidence from undergraduate students at the Muslim University of Morogoro, Tanzania.

MATERIALS AND METHODOLOGY

Study Area and Design: This study adopted a quantitative cross-sectional descriptive research design. Data were collected from undergraduate students at one point in time to describe their AI usage patterns and perceptions of AI's pedagogical role at the Muslim University of Morogoro (MUM), Tanzania. The design was appropriate for describing reported behaviours and examining statistical associations without manipulating study variables; it does not support causal conclusions.

Population, Sampling, and Recruitment: The study targeted 4,721 undergraduate students at the Muslim University of Morogoro, with a minimum sample size of 356 determined using Krejcie and Morgan's (1970) formula. A total of 424 students participated, exceeding the minimum requirement. Eligible participants were undergraduate students from any year of study or faculty who provided informed consent. The questionnaire link was distributed through official WhatsApp groups for each academic program and remained open for four weeks. Duplicate submissions were minimized by enabling the "limit to one response" setting using student registration numbers; participation was voluntary, with no incentives offered.

Instrument Development, Validity, and Reliability: The structured online questionnaire comprised three sections covering demographic information (4 items), AI usage patterns (6 items), and the perceived pedagogical role of AI (12 Likert-scale items), for a total of 22 items. Content validity was assessed by three experts from the Department of Education, who reviewed the instrument for relevance, clarity, and alignment with the study objectives. Reliability analysis yielded an overall Cronbach's alpha coefficient of 0.958, indicating excellent internal consistency and exceeding the recommended threshold of 0.70, as presented in Table 3.

Table 3.

Reliability Analysis of the Research Instrument (N = 424)

Scale/dimension	SPSS item codes	Number of items	Cronbach's alpha (α)
Personalized Learning	C1, C2, C3	3	0.883

Learning Support	C4, C5, C6	3	0.899
Learning Engagement	C7, C8, C9	3	0.898
Learner Autonomy	C10, C11, C12	3	0.862
Overall Pedagogical Role of AI	**C1–C12**	**12**	**0.958**

***Source**: Field data, 2026 (SPSS reliability analysis, N = 424).*

Data Collection and Ethics: Ethical clearance and institutional permission were obtained before questionnaire administration. The Google Forms link was distributed electronically through official university WhatsApp groups across academic programmes. Participants were informed about the purpose of the study and the participation procedures before the questionnaire was distributed, and sufficient time was provided for participation. Participation was voluntary, and confidentiality and anonymity were maintained.

Data Analysis: The data were cleaned, coded, and analyzed using the Statistical Package for the Social Sciences (SPSS). Frequencies and percentages were used to describe respondents' demographic characteristics and AI usage patterns, while means and standard deviations summarized students' perceptions of AI's pedagogical role. Spearman's rank-order correlation was used to examine associations between selected AI usage indicators and perceived pedagogical-role scores. Multiple linear regression was used to examine the joint contribution of the three ordinal-coded predictors (Frequency of AI use, AI use experience, and Self-rated AI proficiency) to variation in the overall perceived pedagogical-role score.

RESULTS AND FINDINGS

Introduction

This section presents the results in line with the three research objectives. It first describes the demographic characteristics of the 424 respondents, then reports students' AI usage patterns and perceptions of AI's pedagogical role, and finally presents the inferential analyses examining associations between AI usage patterns and the perceived pedagogical role of AI

Demographic Information

The demographic profile of the 424 respondents is summarized in Table 4. The sample was fairly balanced by gender, with a slight majority of male students (52.36%) compared with female students (45.28%). The respondents were predominantly young (75.94%), aged between 20 and 24 years, and were mostly first-year students (68.63%). In terms of academic affiliation, the majority were drawn from the Faculty of Arts and Humanities (61.79%), followed by the Faculty of Science (28.54%), reflecting the disciplinary composition of the university.

Table 4

Demographic Characteristics of Respondents (N = 424)

Variable	Category	Frequency (n)	Percentage (%)
A1. Gender	Male	222	52.36
	Female	192	45.28
	Prefer not to say	10	2.36
A2. Age group	20-24 years	322	75.94
	25-29 years	51	12.03
	30 years or above	37	8.73
	Below 20 years	14	3.30
A3. Year of study	First Year	291	68.63
	Second Year	73	17.22
	Third Year	47	11.08
	Fourth Year	13	3.07
A4. Faculty/School	Arts and Humanities	262	61.79

	Science	121	28.54
	Law and Sharia	30	7.08
	Islamic Studies	8	1.89
	Business Administration	3	0.70

***Source**: Field data, 2026 (SPSS frequency output, n = 424).*

AI Usage Patterns among Undergraduate Students

Table 5 shows that 419 respondents (98.82%) reported some use of AI, while 5 (1.18%) reported never using it. A total of 195 respondents (45.99%) reported using AI daily, and 189 (44.57%) used AI several times a week. ChatGPT was the most commonly reported tool (316, 74.53%), followed by Google Gemini (73, 17.22%) and Claude (17, 4.00%); 18 respondents (4.25%) selected other tools. The largest experience group had used AI for 6–12 months (165, 38.92%), while relatively few (75, 17.69%) reported more than two years of experience. Self-rated proficiency was most commonly intermediate (182, 42.93%), followed by advanced (118, 27.83%), and 36 respondents (8.49%) rated themselves as experts. Reliable campus internet access was reported by 43.63% of respondents, whereas 23.58% reported limited or inconsistent access. Smartphones were the primary device for 395 respondents (93.16%), followed distantly by laptops (14, 3.30%).

Table 5

AI Usage Patterns of Undergraduate Students (N = 424)

Variable	**Category**	**Frequency (n)**	**Percentage (%)**
B1. Frequency of AI use	Daily	195	45.99
	Several times a week	189	44.57
	Once a week	16	3.77
	Two to three times a month	13	3.07
	Once a month	6	1.42
	Never	5	1.18
B2. Most-used AI tool	ChatGPT	316	74.53
	Google Gemini	73	17.22
	Claude	17	4.00
	Other	18	4.25
B3. AI use experience	6-12 months	165	38.92
	1-2 years	103	24.29
	Less than 6 months	81	19.10
	More than 2 years	75	17.69
B4. Self-rated AI proficiency	Intermediate	182	42.93
	Advanced	118	27.83
	Beginner	88	20.75
	Expert	36	8.49
B5. Internet accessibility	Reliable on campus	185	43.63
	Reliable at home	114	26.89
	Limited or inconsistent	100	23.58
	Relies on university computer labs	25	5.90
B6. Primary device	Smartphone	395	93.16
	Laptop	14	3.30
	Tablet	6	1.42
	Desktop computer	5	1.18
	University computer lab desktop	4	0.94

Note. [a] *"Other" includes Grok (n = 7), DeepSeek (n = 4), Meta AI (n = 2), Perplexity AI (n = 2), AI Academic (n = 1), Google AI (n = 1), and one unclassifiable free-text response (n = 1). Duplicate labels in the SPSS dataset were merged before reporting.* ***Source****: Field data, 2026 (SPSS frequency output, N = 424).*

Students' Perceptions of the Pedagogical Role of AI

Table 6 presents the dimension-level and overall scores for students' perceived pedagogical role of AI. The overall mean was moderate (M = 3.35, SD = 1.04). Learning support received the highest mean (M = 3.44, SD = 1.15), followed by learning engagement (M = 3.37, SD = 1.14), personalized learning (M = 3.35, SD = 1.13), and learner autonomy (M = 3.26, SD = 1.11). The four subscale reliability coefficients ranged from α = .862 to .899, while the overall scale yielded α = .958, indicating excellent internal consistency across the 12 items and exceeding the recommended threshold of 0.70.

Table 6

Dimension-Level and Overall Scores for the Perceived Pedagogical Role of AI (N = 424)

Dimension	**Items**	**M**	**SD**	**α**	**Level**	**Rank**
Learning Support (C4, C5, C6)	3	3.44	1.15	0.899	High	1
Learning Engagement (C7, C8, C9)	3	3.37	1.14	0.898	Moderate	2
Personalized Learning (C1, C2, C3)	3	3.35	1.13	0.883	Moderate	3
Learner Autonomy (C10, C11, C12)	3	3.26	1.11	0.862	Moderate	4
Overall Pedagogical Role	**12**	**3.35**	**1.04**	**0.958**	**Moderate**	**-**

Note. *Likert-scale interpretation: ≤ 1.80 = Very Low; 1.81–2.60 = Low; 2.61–3.40 = Moderate; 3.41–4.20 = High; > 4.20 = Very High. α = Cronbach's alpha.* ***Source****: Field data, 2026 (SPSS descriptive statistics, N = 424).*

Table 7 presents item-level results across the four dimensions, reflecting respondents' self-reported perceptions of the pedagogical role of AI. The highest-rated item was C6, which concerned AI's role in clarifying difficult concepts (M = 3.63, SD = 1.30). The lowest-rated item was C10, concerning independent learning (M = 3.12, SD = 1.29).

Table 7

Item-Level Descriptive Statistics for the Perceived Pedagogical Role of AI (N = 424)

				Likert Scale Rating				
Dimension	Item	M	SD	*1*	*2*	*3*	*4*	*5*
Personalized Learning	C1. AI provides tailored learning experiences	3.37	1.27	*58*	*42*	*84*	*166*	*74*
	C2. AI adapts support to academic progress/performance	3.34	1.25	*48*	*61*	*89*	*149*	*77*
	C3. AI recommends relevant learning resources	3.33	1.27	*52*	*54*	*104*	*132*	*82*
Learning Support	C4. AI provides timely feedback	3.34	1.23	*46*	*56*	*104*	*142*	*76*
	C5. AI enables efficient information access	3.36	1.25	*48*	*56*	*101*	*135*	*84*
	C6. AI clarifies difficult concepts	3.63	1.3	*37*	*57*	*75*	*114*	*141*
Learning Engagement	C7. AI increases learning engagement	3.35	1.25	*46*	*64*	*87*	*149*	*78*
	C8. AI motivates active participation	3.38	1.28	*47*	*66*	*81*	*141*	*89*
	C9. AI makes learning interactive	3.37	1.24	*45*	*58*	*99*	*139*	*83*
Learner Autonomy	C10. AI encourages independent learning	3.12	1.29	*65*	*71*	*100*	*125*	*63*

	C11. AI enhances planning, monitoring, and evaluation	3.3	1.21	*42*	*70*	*101*	*141*	*70*
	C12. AI supports goal setting and achievement	3.37	1.26	*49*	*54*	*97*	*139*	*85*

***Note**. M = mean; SD = standard deviation. Likert scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree. Each row sums to 424. **Source**: Field data, 2026 (SPSS descriptive output, N = 424).*

Associations between AI Usage Patterns and the Perceived Pedagogical Role of AI

a) Spearman's Rank-Order Correlations

Table 8 presents Spearman rank-order correlations between three AI usage indicators: Frequency of AI use, AI use experience, and Self-rated AI proficiency; and students' perceived pedagogical-role scores. None of the correlations between the usage indicators and the overall score or any dimension was statistically significant (all $p > .05$), and the coefficients were small ($|\rho| \leq .050$). These findings do not establish that usage and perceived value are independent in all contexts; rather, they indicate that these specific indicators were not associated with perceived pedagogical-role scores in this sample.

Table 8

Spearman's Rank-Order Correlations between AI Usage Patterns and the Perceived Pedagogical Role of AI (N = 424)

AI Usage Pattern	Personalized Learning ρ (p)	Learning Support ρ (p)	Learning Engagement ρ (p)	Learner Autonomy ρ (p)	Overall ρ (p)
Frequency of AI use	−.050 (.309)	.013 (.790)	−.035 (.473)	.001 (.986)	−.026 (.599)
AI use experience	.021 (.664)	−.017 (.733)	−.046 (.350)	.035 (.469)	.002 (.973)
Self-rated AI proficiency	−.014 (.779)	−.035 (.471)	−.049 (.311)	−.001 (.978)	−.028 (.562)

***Note**. Values in parentheses are two-tailed p values. ρ = Spearman's rank-order correlation coefficient. Internet accessibility and primary device were not included in this correlation analysis. **Source**: Field data, 2026 (SPSS correlation output, N = 424).*

b) Multiple Linear Regression

A standard Enter multiple regression was conducted with Frequency of AI use, AI use experience, and Self-rated AI proficiency as predictors and the overall perceived pedagogical-role score as the dependent variable (Table 9). The model was not statistically significant, $F(3, 420) = 0.039$, $p = .990$, $R = .017$, $R^2 = .000$ (rounded), adjusted $R^2 = -.007$. None of the predictors was statistically significant: frequency ($B = .009$, $\beta = .009$, $p = .860$), duration of use ($B = .013$, $\beta = .013$, $p = .795$), or proficiency ($B = -.004$, $\beta = -.004$, $p = .933$). VIF values ranged from 1.007 to 1.015, indicating no evidence of problematic multicollinearity. The supplied output does not document all regression diagnostics, so the model should be interpreted with that limitation in mind.

Table 9

Multiple Linear Regression Results for AI Usage Patterns Predicting the Overall Perceived Pedagogical Role of AI (N = 424)

Predictor	B	SE	β	t	p	VIF	Decision
Constant	3.354	0.051	–	66.241	< .001	–	–
Frequency of AI use	0.009	0.051	0.009	0.177	0.86	1.007	Not Significant

AI use experience	0.013	0.051	0.013	0.261	0.795	1.015	Not Significant
Self-rated AI proficiency	−.004	0.051	−.004	−.084	0.933	1.015	Not Significant

Model summary	*R*	*R²*	*Adjusted R²*	*F(3,420)*	*df1*	*df2*	*p*
Model1	0.017	0	−.007	0.039	3	420	0.99

***Note**. Multiple linear regression was conducted using ordinal-coded AI usage predictors, which were standardized as Z-scores before entry. B = unstandardized coefficient; β = standardized coefficient; VIF = variance inflation factor. The overall model was not statistically significant. **Source**: Field data, 2026 (SPSS regression output, N = 424).*

DISCUSSION, CONCLUSION, AND RECOMMENDATIONS

Discussion

AI Usage Patterns among Undergraduate Students

The findings show that 384 of the 424 respondents (90.57%) used AI daily or several times a week, while ChatGPT was the most frequently reported tool (74.53%). Smartphones were the primary access devices for 93.16% of respondents. These findings are consistent with reports of substantial student AI use in Tanzania and Zambia (Mollel, 2025; Mudenda et al., 2026). Consistent with the Technology Acceptance Model (TAM), perceived usefulness and ease of access may help explain AI use, although these factors were not directly tested (Davis, 1989).

The findings also reveal potential constraints. Intermediate proficiency was the most common self-rating, and 23.58% of respondents reported limited or inconsistent internet access. Similar challenges involving digital readiness and internet connectivity have been reported in other university contexts (Falebita & Kok, 2025; Kelly et al., 2023) and across African higher education (Mambile & Mwogosi, 2024; Medina-Gual & Parejo, 2025; Oguntona & Emere, 2025). These descriptive findings support initiatives to strengthen AI literacy and digital access. However, self-rated proficiency is not an objective skills test, and the survey did not assess the accuracy of students' AI use or the quality of their prompting and evaluation practices; these issues warrant further study.

Students' Perceptions of the Pedagogical Role of AI

Students rated AI's perceived pedagogical role as moderate overall (M = 3.35, SD = 1.04), with learning support receiving the highest dimension mean (M = 3.44, SD = 1.15). Clarifying difficult concepts was the highest-rated item (M = 3.63, SD = 1.30), consistent with literature highlighting AI's potential to provide feedback and scaffold learning (Naseer & Khawaja, 2025; Yin et al., 2024). However, these findings reflect students' perceptions rather than measured learning gains or causal effects.

Learner autonomy received the lowest dimension mean (M = 3.26), while becoming a more independent learner was the lowest-rated item (M = 3.12, SD = 1.29). This suggests that students perceived AI as more useful for immediate learning support than for promoting independent learning. This finding aligns with concerns that AI may not foster self-regulated learning without deliberate pedagogical design (Achuthan, 2025; Lan & Zhou, 2025; Sahu & Sabar, 2026). However, the study did not directly measure AI dependence or self-regulation.

Relationship between AI Usage Patterns and the Perceived Pedagogical Role of AI

Frequency of AI use, duration of use, and self-rated proficiency were not significantly associated with the overall perceived pedagogical role of AI. The regression model explained virtually none of the variance (R^2 = .000 after rounding). Although previous studies reported relationships between technology readiness, self-efficacy, AI-use attitudes, and perceived usefulness (Amani & Bisriyah, 2025; Falebita & Kok, 2025), differences in constructs and analytical approaches may limit direct comparisons.

These findings suggest that usage indicators alone may not adequately explain students' perceptions of AI's pedagogical role. Instructional design, AI literacy, task type, and interaction quality may also be relevant (Du Plooy et al., 2024; Kelly et al., 2023; Mustofa et al., 2025; Smerdon, 2024; Tbaishat et al., 2026; Yin et al., 2024), although these factors were not examined in the present study.

Table 8 reports associations between usage indicators and perceived pedagogical-role scores, not correlations among the four pedagogical dimensions. Therefore, their intercorrelations cannot be established from these results. Future research could investigate whether instructional design, AI literacy, and the quality of AI-supported interactions help explain students' perceptions (Msambwa et al., 2025; Rong & Yu, 2023; Stone, 2024).

Conclusion

This study examined undergraduate students' AI usage patterns and their perceived pedagogical role of AI at the Muslim University of Morogoro, Tanzania. Most respondents reported frequent AI use, with ChatGPT the most commonly used tool and smartphones the primary access device. Students' overall perception of AI's pedagogical role was moderate, with learning support rated highest and learner autonomy lowest.

No statistically significant associations were detected between the overall perceived pedagogical role score and the three usage indicators tested: frequency, experience, and self-rated proficiency. The regression model was not statistically significant and explained virtually none of the variance. These findings mean that the measured indicators did not explain differences in perceived pedagogical role in this sample; they should not be interpreted as evidence of causal effects or universal independence between usage and perceived value. The findings support recommendations for purposeful pedagogical design, AI literacy, learner autonomy, and improved digital access.

Finally, the cross-sectional design captured responses at one point in time and therefore does not support causal conclusions or broad generalizations. Instead, the study provides case-study evidence on AI usage and its perceived pedagogical role in the learning process. Participation was voluntary, and recruitment was continued to obtain the target sample.

Recommendations

Based on the findings, the following recommendations are proposed:

- *Institutionalize AI literacy programmes:* The university should provide structured training that moves students beyond basic, single-tool use toward critical, multi-tool, and ethically responsible AI practice, given that most students are only intermediate users.

- *Embed AI into pedagogy, not just access:* Because usage intensity alone was not significantly associated with perceived pedagogical value in this study, lecturers should intentionally design assessments and learning activities that use AI to deepen conceptual understanding, feedback, and engagement.

- *Strengthen learner autonomy:* Curriculum developers should pair AI use with self-regulated learning strategies — goal setting, self-monitoring, independent problem solving, and reflection — to counter the comparatively low autonomy ratings and reduce the risk of dependence.

- *Improve digital infrastructure and equity:* The institution, internet providers, and policymakers should expand reliable internet access, lower costs, and provide device support, given that nearly a quarter of students face inconsistent connectivity and almost all rely on smartphones.

- *Develop responsible-use and integrity policies:* Clear institutional guidelines and ethical frameworks for AI use should be established to safeguard academic integrity while supporting legitimate learning.

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