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Artificial Intelligence Usage on Students' Self-Efficacy and Academic Achievement in Among University Students in Kenya

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Abstract:

Purpose: *The main purpose of this study was to examine the effect of Artificial Intelligence (AI) usage on academic achievement among university students in Kenya, with a particular focus on the mediating role of students' self-efficacy.*
Material/methods: *The study was guided by the Diffusion of Innovations Theory and Social Cognitive Theory (SCT) and anchored on the positivist research philosophy. The target population comprised 89,391 third- and fourth-year undergraduate students drawn from 11 universities in Nairobi County, Kenya. A sample of 398 respondents was selected using proportionate stratified sampling. Primary data were collected through structured self-administered questionnaires and analyzed using both descriptive and inferential statistics. Hayes' PROCESS Macro Model 4 was used to test the direct and mediating effects.*
Findings: *The findings revealed that AI usage significantly enhances students' academic self-efficacy by strengthening their confidence in completing academic tasks. Students with higher levels of self-efficacy demonstrated improved academic achievement, underscoring the importance of confidence in learning outcomes. The results further showed that AI usage does not directly improve academic achievement, but instead influences performance indirectly through students' self-efficacy.*
Conclusion*: The study concludes that students' self-efficacy fully mediates the relationship between AI usage and academic achievement. This implies that the academic benefits of AI are realized through enhanced student confidence rather than through direct effects on performance.*
Value: *The study extends existing knowledge by showing that AI usage improves academic achievement indirectly through students' self-efficacy rather than through a direct effect. It also offers practical insight to universities and policymakers that AI integration should be accompanied by strategies that build students' confidence in academic tasks.*

Keywords*: Artificial Intelligence, Higher Education, AI Usage, Academic Achievement, Students' Self-Efficacy*

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1. Introduction

In the era of AI, academic achievement remains a cornerstone for human capital development and economic growth. While AI automates routine tasks, a well-educated workforce is essential to effectively use technology and drive innovation. Strong academic outcomes, coupled with students' confidence in their abilities academic self-efficacy are closely linked to economic progress, with improved student learning outcomes contributing significantly to GDP per capita (Educational Research Institute, 2025). Africa stands to gain economically from AI, but realizing these benefits depends on producing graduates who are both academically competent and AI-literate (Ekdahl, 2025).

The adoption of AI in higher education has expanded rapidly, with tools supporting information search, clarification of concepts, and immediate feedback. Research shows that AI can enhance understanding, efficiency, and academic performance, while also improving engagement, organization, and problem-solving skills (Bai et al., 2022; Neji et al., 2023). Importantly, AI use has been found to strengthen students' academic self-efficacy by providing personalized support and guidance, which boosts confidence and persistence in learning tasks, particularly among students with initially low confidence (Hmoud et al., 2024; Zhai & Li, 2025).

Despite these benefits, overreliance on AI poses risks. Unguided AI use can reduce critical thinking, analytical skills, and deep learning, as students may depend on AI-generated outputs rather than actively engaging with content (Perkins, 2024). Additionally, ethical concerns such as academic misconduct arise when AI-generated work replaces genuine learning (Cotton et al., 2024; Baidoo-Anu & Owusu Ansah, 2023). Therefore, responsible and moderated use of AI is necessary to ensure it acts as a scaffold that enhances both self-efficacy and performance, without undermining independent problem-solving and skill development (Jeilani & Abubakar, 2025).

The Kenyan higher education context highlights the urgency of this research. Kenya leads globally in ChatGPT adoption, with over 42% of internet users having accessed the tool within a month (North Africa Post, 2025). Universities report growing use of AI-generated assignments, prompting policy debates and reliance on detection software (Owino, 2025; Prothero, 2024). Studies indicate AI use significantly affects academic outcomes and stress the need for clear guidelines and AI literacy training (Shikokoti & Reuben, 2024). Understanding how AI tools influence students' self-efficacy and academic achievement will enable Kenyan universities to design strategies that produce graduates capable of innovating and thriving in the modern, technology-driven economy.

1. Theoretical Review

Social Everett Rogers developed the Diffusion of Innovations (DOI) Theory (1962) to explain how, why, and at what rate new ideas and technologies spread within a social system over time, defining diffusion as the process through which an innovation is communicated through specific channels among members of a social system and categorizing adopters into innovators, early adopters, early majority, late majority, and laggards, each influencing the speed and extent of adoption (García-Avilés, 2020). The theory further identifies five stages in the innovation-decision process—knowledge, persuasion, decision, implementation, and confirmation—which individuals undergo

before fully adopting a new technology (Vejlgaard, 2018). DOI theory has been widely applied in educational technology research to explain how digital tools such as learning management systems and online learning platforms become integrated into academic environments, with adoption influenced by factors such as relative advantage, compatibility, complexity, trialability, and observability (Frei-Landau et al., 2022). This theory is highly relevant to the present study because artificial intelligence (AI) represents an emerging educational innovation whose adoption among university students in Kenya follows similar diffusion processes, where students first become aware of AI tools, develop perceptions about their usefulness, decide whether to use them, implement them in academic tasks, and evaluate their impact on learning outcomes. As students adopt and interact with AI tools, their experiences can influence their academic self-efficacy by enhancing confidence in completing assignments, improving problem-solving ability, and strengthening perceived competence, which ultimately contributes to improved academic achievement. DOI theory also explains variations in AI usage among students, as early adopters may benefit sooner through improved learning efficiency and academic performance, while late adopters may experience slower gains, highlighting how the diffusion and adoption of AI tools within universities can shape students' confidence, learning behaviors, and academic success.

2. Empirical Review (Hypothesis Development)

Several empirical studies indicate that the use of artificial intelligence technologies for learning tasks is associated with improved academic outcomes among university students. For instance, Khan, et al., (2025) found that the use of AI tools such as ChatGPT, Grammarly, and Google Bard had a significant positive effect on undergraduate students' academic performance, particularly in writing assignments, research activities, and examination preparation. Their findings revealed that students who frequently used AI tools performed better academically than those with lower levels of usage. Similarly, a large-scale study by Pacheco-Mendoza et al., (2023), involving 1,843 university students in Pakistan, demonstrated that AI-driven systems significantly supported academic achievement by identifying individual learning needs and providing timely academic interventions that enhanced performance outcomes. In addition, a smaller quantitative study by Ma'amor et al., (2024) conducted among undergraduates at UiTM Puncak Alam Campus reported that AI usage for study purposes had a significant influence on academic performance, with regression results showing that higher levels of AI use explained a meaningful proportion of variance in academic outcomes. Collectively, these findings support the view that increased engagement with AI tools can enhance university students' academic achievement.

Beyond objective performance measures, research also shows positive associations between AI usage and students' perceptions of their academic success. Ajakaiye et al., (2025), in a study among undergraduates in Kwara State, found a positive correlation between the use of AI tools such as QuillBot and ChatGPT and perceived academic achievement, suggesting that students who regularly rely on AI for academic tasks tend to report better learning outcomes. Consistent with this, broader surveys by Vieriu and Petrea (2025) on AI adoption in higher education revealed widespread integration of AI tools into students' academic routines, with frequent use for homework, research, and writing tasks practices that many students associate with improved comprehension and academic performance. Although not focused exclusively on test scores, Adewale et al., (2024) observed that the high frequency of AI use in academic tasks reflects students' belief that these technologies improve learning efficiency and outcomes, a perception

that correlates with higher engagement levels and improved performance indicators in related analyses.

However, not all empirical evidence points to uniformly positive effects, highlighting the importance of how AI tools are used. For example, Archana et al., (2025) reported that although over 90% of surveyed students used AI for academic activities, differences in usage patterns produced varied outcomes. Some forms of AI use enhanced task efficiency, while others showed mixed effects on deeper learning processes. Similarly, Dai et al., (2025) provided experimental evidence, albeit outside strict university contexts, indicating that certain patterns of AI-generated feedback can produce differential effects on academic achievement, benefiting some students while offering limited or even negative effects for others depending on learning autonomy and usage context. While these findings do not undermine the potential value of AI tools in education, they suggest that the effect of AI usage on academic achievement is contingent on usage type, learning environment, and student characteristics. Consequently, this study hypothesized that:

$H_{1:}$ Artificial Intelligence Usage Significantly Influences Academic Achievement

Meta-analytic evidence demonstrates that the use of AI in educational settings can positively influence learners' self-efficacy. A recent meta-analysis by Ren et al., (2026), synthesizing findings from 23 empirical studies, reported a statistically significant positive effect of AI-supported learning on students' self-efficacy, with an overall medium effect size. This indicates that AI-enabled learning environments generally enhance students' confidence in their learning abilities across different disciplines and educational contexts. Similarly, Berdida et al., (2025), in a study conducted within nursing education, found that higher levels of AI literacy were positively associated with AI self-efficacy among nursing students. Their results showed that AI literacy explained nearly 29% of the variance in students' confidence in using AI technologies, suggesting that increased familiarity with AI tools strengthens beliefs in one's ability to interact with them effectively. In addition, an intervention study by Woo et al., (2024) on prompt engineering revealed that structured training in interacting with AI systems such as designing effective prompts for large language models significantly improved students' AI self-efficacy and understanding of AI concepts compared to baseline levels, highlighting the role of guided and active AI use in building psychological confidence.

Empirical evidence further indicates that specific patterns and frequencies of AI usage are closely associated with students' self-efficacy. In a quantitative study of Austrian university students, Bećirović et al., (2025) found that the practical application of AI tools had a significant and positive effect on AI self-efficacy, demonstrating that students' confidence in solving AI-related tasks increased with more frequent and effective use of these tools, even when direct effects on academic performance were not always observed. Similarly, Chen (2025) examined the relationship between frequency of AI software use and academic self-efficacy and found that students who engaged regularly with AI tools reported significantly higher levels of academic self-efficacy at certain usage thresholds. In a cross-sectional survey, Yavich et al., (2025) also reported that students who used AI tools more extensively for academic tasks

exhibited higher confidence in their ability to complete academic work, underscoring the psychological link between AI usage habits and self-efficacy beliefs.

Beyond direct relationships, research has explored the mechanisms through which AI usage influences students' self-efficacy. Zhou et al., (2025), in a study within engineering education, found that students' competence in using generative AI tools significantly predicted higher AI self-efficacy, suggesting that hands-on engagement reinforces belief in one's ability to employ AI for learning tasks. Similarly, Yilmaz Soylu et al., (2025), using structural equation modeling, demonstrated that key components of AI literacy such as conceptual understanding and practical applicationpositively predicted perceived usability and satisfaction with AI tools, which in turn were associated with higher perceived learning effectiveness, a construct closely related to self-efficacy. Furthermore, Dang and Nguyen (2026) showed that AI self-efficacy interacts with factors such as duration of AI usage and students' year of study to influence academic outcomes like GPA, indicating that confidence in AI use can shape broader motivational and academic pathways. Collectively, these findings suggest that AI usage enhances students' self-efficacy both directly and indirectly through cognitive, motivational, and engagement-related mechanisms. Based on the reviewed empirical evidence, this study hypothesized that:

$H_{2:}$ Artificial Intelligence Usage on students' Self-Efficacy

Empirical evidence consistently demonstrates a strong positive relationship between students' self-efficacy and academic achievement. In a cross-sectional study by Meng and Zhang (2023) involving 258 university students, academic self-efficacy was found to be strongly and positively correlated with academic performance and was shown to directly predict academic achievement even after controlling for student engagement. Similarly, a study conducted among undergraduate students from two universities reported a statistically significant positive association between academic self-efficacy scores and students' grade point average (GPA), indicating that learners with higher self-efficacy tended to achieve better academic outcomes (Musa, 2025). In another quantitative investigation examining university students across Egypt and Saudi Arabia, Smith and Al-Amri (2025) found that self-efficacy positively influenced academic achievement in both contexts, underscoring the robustness of self-efficacy as a predictor of academic success across different cultural and institutional environments. Collectively, these studies provide strong empirical support for the argument that students who believe in their academic capabilities are more likely to perform better academically.

Beyond direct associations, research has also highlighted the mechanisms through which self-efficacy influences academic achievement. For example, Zhao et al. (2025) found that academic self-efficacy not only had a positive direct effect on academic performance but also enhanced academic engagement, which in turn further improved achievement outcomes, suggesting a mediating pathway. Similarly, Kogei (2021), in a study conducted among secondary-level students in Kenya, established that self-efficacy significantly predicted academic performance by strengthening students' academic motivation, effort, and persistence. In a mixed-methods study of first-year college students, Maharani and Purnama (2023) reported that higher self-efficacy levels influenced key academic behaviors such as persistence, effective use of learning strategies, and resilience when facing academic challenges, all of which contributed to

improved academic achievement. These findings demonstrate that self-efficacy supports academic success not only directly but also indirectly through enhanced engagement, motivation, and adaptive learning behaviors.

Evidence further indicates that the positive influence of self-efficacy on academic achievement is consistent across diverse student populations and educational contexts. For instance, Moussa (2023) found that general self-efficacy significantly predicted academic success among higher education students in the United Arab Emirates, with strong positive correlations observed between self-efficacy beliefs and achievement indicators. Studies involving secondary school populations similarly show that students with higher domain-specific self-efficacy—such as in English language learning—tend to attain higher academic scores, demonstrating the applicability of self-efficacy effects across age groups and subject areas (Guo & Tang, 2025). Additionally, several studies have reported that self-efficacy mediates the effects of other psychological and behavioral factors, such as self-management and motivation, on academic achievement, further highlighting its central role in the academic success process (Smith & Al-Amri, 2025; Zhao et al., 2025). Overall, the reviewed literature strongly supports the conclusion that students' self-efficacy is a significant and generalizable predictor of academic achievement across educational levels and contexts. Based on the reviewed empirical evidence, the study hypothesized that:

$H_{3:}$ Students' Self-Efficacy has a Significant Influence on Academic Achievement

A growing body of empirical research supports the view that self-efficacy serves as a key mechanism through which technology use and digital competence translate into improved academic and learning outcomes. For instance, Akter and Rahman (2025) demonstrated that self-efficacy significantly mediated the relationship between artificial intelligence (AI) usage and educational outcomes such as creativity and innovation among university students, highlighting that confidence in one's capabilities is crucial for converting AI use into positive learning effects. Similarly, Zakir et al. (2025), in a study of Indonesian university students, found that self-efficacy significantly mediated the relationship between digital literacy and academic performance, alongside other factors, suggesting that digital skills enhance academic achievement by strengthening students' confidence and competence in technology-rich environments. Supporting these findings, Abu Bakar et al. (2023) reported that self-efficacy statistically mediated the association between digital literacy and academic performance, reinforcing the argument that students' beliefs in their abilities are central to how digital competencies influence academic outcomes.

Additional studies conducted in technology-enhanced learning contexts further substantiate the mediating role of self-efficacy. Although some of these studies do not directly measure academic achievement, their findings remain relevant because constructs such as engagement, confidence, and motivation are well-established predictors of academic performance. For example, Ibrahim and Aldawsari (2023) found that AI literacy significantly improved AI self-efficacy, which in turn mediated positive learning outcomes such as students' willingness to communicate in AI-supported learning environments. In a large cross-sectional study of nursing students, He et al., (2025) reported that AI literacy was positively associated with AI self-efficacy, which itself strongly predicted learning engagement an important antecedent of academic

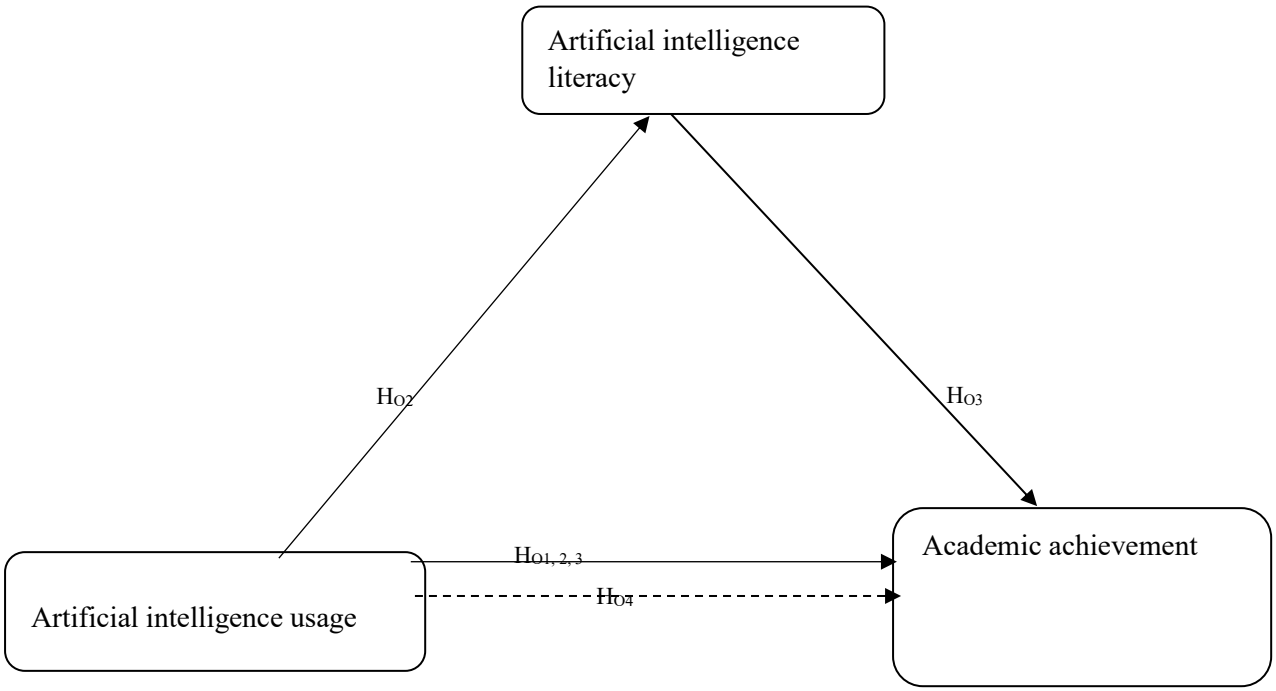
achievement thereby suggesting a potential mediating pathway. Likewise, Yuan et al. (2024), in studies involving medical students, demonstrated that academic self-efficacy reduced procrastination and enhanced academic confidence, which subsequently supported improved academic performance, further illustrating the mediating function of self-efficacy between digital competence and academic outcomes.

From a theoretical perspective, emerging models grounded in Bandura's social cognitive theory emphasize self-efficacy as a central mediator linking technological engagement to academic success. Conceptual frameworks proposed by Siregar et al. (2025) suggest that students' confidence in using AI tools directly influences how effectively these tools are applied to learning tasks, thereby shaping academic outcomes such as performance and achievement. Although empirical studies explicitly testing the mediating role of self-efficacy between AI usage and academic achievement remain limited, adjacent research on educational technologies consistently shows that students with higher self-efficacy engage more deeply with digital learning tools and achieve better academic results. Prior mediation studies in digital literacy contexts further argue that self-efficacy enables learners to transform technological skills into effective learning behaviors (Abu Bakar et al., 2023). Collectively, these theoretical insights and empirical findings support the proposition that self-efficacy plays a critical mediating role in the relationship between AI usage and academic achievement. Based on the reviewed literature, the study hypothesized that:

H_4: Students' Self-Efficacy Mediates the Relationship Between Artificial Intelligence Usage and Academic Achievement.

The conceptual framework examines the complex interplay between Artificial Intelligence (AI) Usage, students' self-efficacy, and academic achievement. The model builds on empirical evidence and theoretical foundations to illustrate how AI-related competencies influence academic outcomes.

Independent Variable **Mediating Variable** **Dependent Variable**



Methodology

This study was anchored on the positivist research philosophy, which assumes that reality is objective and can be measured using observable and quantifiable indicators. Positivism is appropriate where hypotheses are tested through statistical techniques to establish relationships among variables. The philosophy was suitable for this study since it focused on examining the direct, mediating, moderating, and moderated mediation effects of Artificial Intelligence (AI) usage and Artificial Intelligence literacy on students' academic achievement, with students' self-efficacy serving as an intervening variable. The study adopted an explanatory cross-sectional survey research design. This design was appropriate because it enables the examination of cause–effect relationships among variables within a single point in time. The design allowed for the collection of quantitative data required to test hypotheses concerning the influence of AI usage and AI literacy on academic achievement and the role of self-efficacy in these relationships.

Target Population and Sampling

The study targeted 89,391 third- and fourth-year undergraduate students drawn from 11 universities (4 public and 7 private) in Nairobi County. From this population, a sample was determined using Slovin's formula as developed by Yamane (1967), adopting a 5% margin of error, which falls within the acceptable range for social and educational research (Story & Tait, 2019). This resulted in a sample size of 398 respondents, which was considered adequate for robust quantitative analysis. The study employed proportionate stratified sampling, with universities treated as strata to ensure fair representation across institutional types. Thereafter, simple random sampling was applied within each stratum to select individual respondents. Out of the 398 questionnaires administered, 322 were successfully returned, representing a response rate of 80.9 percent. Following data screening and cleaning, 13 questionnaires were excluded, of which 8 contained significant outliers and 5 had substantial missing values. This resulted in 307 usable questionnaires, translating to a valid response rate of 77.1 percent of the total sample, which is considered satisfactory for quantitative analysis.

Data Collection, Validity, and Reliability

Primary data were collected using a structured self-administered questionnaire. The questionnaire consisted of sections measuring Artificial Intelligence usage, Artificial Intelligence literacy, students' self-efficacy, and academic achievement. Academic achievement was measured using the Academic Achievement Questionnaire (AAQ), which captures students' perceived academic performance across assessment, learning outcomes, and task completion dimensions. The use of a questionnaire was appropriate as it facilitated the collection of standardized data from a large number of respondents efficiently. Validity of the research instrument was ensured through content and construct validity. Content validity was achieved by consulting experts in educational technology and research methodology, while construct validity was assessed using factor analysis. Reliability was tested using Cronbach's alpha coefficient, with values of 0.70 and above considered acceptable, indicating internal consistency of the measurement scales.

Artificial Intelligence Usage was measured using items adapted from prior studies examining students' engagement with AI-based learning tools, including intelligent tutoring systems, generative AI applications, and AI-supported academic platforms (Kumar et al., 2021; Zhai et al., 2021). The scale assessed frequency, purpose, and intensity of AI use in academic activities, with higher scores indicating greater AI usage.

Students' self-efficacy was measured using items adapted from established academic self-efficacy scales that assess students' confidence in completing academic tasks, managing coursework, and overcoming learning challenges (Bandura, 1997; Zimmerman, 2000). Higher scores represented stronger beliefs in one's academic capabilities.

Academic achievement was measured using the Academic Achievement Questionnaire (AAQ)**,** a validated self-report instrument designed to capture students perceived academic performance across assessment outcomes, learning effectiveness, and task completion (Richardson et al., 2012; York et al., 2015). The AAQ has been widely used in higher education research and has demonstrated acceptable reliability and construct validity.

Data Analysis and Model Specification

Following data preparation, the study employed both descriptive and inferential statistical analyses. Descriptive statistics, including frequencies, means, standard deviations, skewness, and kurtosis, were used to summarize the data and assess distributional properties, while correlation analysis was conducted to examine the strength and direction of relationships among variables and to check for potential multicollinearity. Inferential analysis relied primarily on multiple linear regression, supported by Hayes' PROCESS macro, to test direct, mediating, moderating, and moderated mediation effects. Specifically, PROCESS Model 1 was used to test moderation effects through interaction terms, PROCESS Model 4 was applied to examine mediation effects by estimating indirect effects (path a × b), and PROCESS Model 8 was employed to test moderated mediation, where the strength of the mediating relationship was conditional on the level of the moderator. The significance of indirect and conditional effects was assessed using bootstrapping procedures with 5,000 resamples, as recommended by Hayes (2018), providing bias-corrected confidence intervals. Ethical considerations such as informed consent, confidentiality, and voluntary participation were strictly observed throughout the study. However, the study acknowledges limitations related to the use of self-reported data, potential common method bias, and the reliance on a cross-sectional quantitative design, which may restrict causal inferences.

3. Findings

Table 1 presents the demographic characteristics of the respondents based on gender and age bracket among university students in Kenya. The findings indicate that female students constituted 59% of the respondents while male students accounted for 41%, showing that female students formed the majority of the sample. In terms of age distribution, most students (73%) were aged between 21 and 30 years, followed by 22.8% aged 20 years and below, while only a small proportion were aged between 31 and 40 years (2.6%) and 41 and 50 years (1.6%)

Table 1 Students' Characteristics

		Frequency	Percent
Gender	Male	126	41
	Female	181	59
	Total	307	100
Age Bracket	20 years and below	70	22.8
	21- 30 yrs	224	73
	31- 40 yrs	8	2.6
	41-50 yrs	5	1.6
	Total	307	100

Descriptive Statistics

Table 2 presents the descriptive statistics on artificial intelligence (AI) usage among university students in Kenya. The findings show that the overall mean score for AI usage was 3.54 (SD = 0.84), indicating a relatively high level of AI usage among students in their academic activities. The highest usage was reported in using AI to explain difficult academic concepts, followed by using AI to search for academic information and research materials and compare information from different sources, suggesting that students primarily rely on AI as a learning support and research tool. Similarly, students frequently used AI to generate practice questions, check accuracy of information, and complete class assignments, highlighting the important role of AI in enhancing understanding, academic preparation, and assignment completion. However, relatively lower usage was reported in using AI for translation, designing posters or visual content, and writing essays or reports, suggesting that students were comparatively less reliant on AI for creative and language-related tasks. The moderate standard deviations across the items indicate some variability in students' AI usage, but overall, the findings demonstrate that AI has become an important academic support tool that enhances students' learning processes, research activities, and academic performance.

Table 2 AI usage

n=307	Mean	Std. Dev
I use AI tools to complete my class assignments.	3.73	1.07
I use AI to write essays, reports, or term papers.	3.13	1.31
I use AI to help write my research project/thesis.	3.71	1.16
I use AI to edit grammar and improve writing quality.	3.49	1.41
I use AI to paraphrase or rephrase content.	3.33	1.39
I use AI to summarize long texts or articles.	3.55	1.26
I use AI to outline or structure my academic work.	3.45	1.43
I use AI to proofread my assignments before submission.	3.16	1.43
I use AI to generate citations or reference lists APA format	3.19	1.35
I use AI to explain difficult academic concepts.	4.08	0.95
I use AI to prepare for examinations.	3.63	1.27
I use AI to revise lecture content.	3.50	1.39
I use AI to receive feedback on my answers.	3.55	1.29
I use AI to generate practice questions or quizzes.	3.84	1.04
I use AI to improve my study habits and strategies.	3.66	1.26

I use AI to access visual learning aids (videos, diagrams, charts).	3.38	1.26
I use AI to explore topics beyond what is taught in class.	3.71	1.24
I use AI to search for academic information/research materials/ literature	3.89	1.00
I use AI to check the accuracy of information I find online.	3.82	1.12
I use AI to compare information from different sources.	3.89	1.01
I use AI to generate research ideas or problem statements.	3.78	0.97
I use AI to create class presentations or slides.	3.25	1.22
I use AI to design posters or visual content for school projects.	3.11	1.34
I use AI-powered translation tools to communicate in different languages.	3.06	1.46
AI usage	**3.54**	**0.84**

Table 4 presents the descriptive statistics on academic self-efficacy among university students in Kenya. The findings show that the overall mean score for academic self-efficacy was 4.03 (SD = 0.61), indicating a high level of confidence among students in their academic abilities. The highest levels of agreement were observed in students' ability to keep working hard even in subjects they do not enjoy and prepare adequately for their subjects, suggesting strong academic persistence and preparation skills. Students also reported high confidence in their ability to develop learning strategies for new subjects and stay focused during lessons, indicating strong self-regulated learning abilities. However, relatively lower mean scores were observed in students' ability to understand why they perform poorly when they fail and manage difficult academic or personal situations, suggesting comparatively lower confidence in self-evaluation and coping with academic challenges. The high mean score and relatively low standard deviation indicate that most students possess strong academic self-efficacy, which is essential for effective learning, academic persistence, and improved academic achievement.

Table 3 Academic Self-Efficacy

n=307	**Mean**	**Std. Dev**
I am able to prepare adequately for the subjects in my program.	4.29	0.79
I am able to develop strategies to learn subjects I have never studied before.	4.24	0.84
I am able to stay focused during lessons or lectures.	4.22	0.72
I am able to connect ideas and concepts across different subjects.	4.03	0.87
I am able to keep working hard even in subjects I do not enjoy.	4.32	0.70
I am able to study without needing help from others.	4.24	0.83
I am able to achieve goals that I set for myself.	3.96	0.96
I am able to understand why I perform poorly when I fail.	3.69	1.14
I am able to make decisions for myself without being influenced by others.	3.78	1.11
I am able to manage difficult academic or personal situations.	3.73	1.02
I am able to align my ambitions with my future career choices.	3.94	1.01
I am able to make decisions even when there is a risk of failing.	4.02	0.93
I am able to evaluate situations and choose what is best for me.	3.76	1.10
I am able to avoid getting involved in situations I do not approve of.	3.72	1.05
I am able to modify rules or procedures set by others when necessary.	3.95	0.98
I am able to accept rules even when I do not agree with them.	4.14	0.79
I am able to express my disagreement with teachers' ideas respectfully.	4.22	0.79
I am able to talk openly about my difficulties with my teachers.	4.12	0.97

I am able to express doubts or seek clarification about lessons.	4.11	1.00
I am able to ask teachers for help when facing academic challenges.	3.90	1.12
I am able to discuss an evaluation that I believe is unfair.	4.02	0.83
I am able to ask others for help to overcome difficulties.	4.20	0.71
I am able to contribute to creating a positive environment with classmates.	4.01	0.80
I am able to cooperate well with colleagues during group work.	3.87	1.07
I am able to build good relationships with classmates.	4.08	0.99
I am able to avoid unnecessary conflict with others.	4.05	0.84
I am able to discuss challenges I face at the university with my parents or guardians.	4.29	0.79
Academic Self-Efficacy	4.03	0.61

Table 5 presents the descriptive statistics on academic achievement among university students in Kenya, showing an overall mean score of 3.94 (SD = 0.55), which indicates a high level of academic capability among students. The highest levels of agreement were observed in students' ability to think about new ideas more frequently than most people, frequently think of new inventions or improvements, and become excited when developing new ideas, suggesting strong intellectual curiosity, creativity, and innovation. Students also reported high confidence in their ability to generate multiple solutions to problems, think of ideas that others have not considered, and shift between ideas effectively, indicating strong cognitive flexibility and problem-solving skills that are essential for academic success. However, relatively lower mean scores were observed in students' ability to exercise critical and reflective thinking, combine ideas in new ways, willingness to enroll in courses focused on developing original ideas, and recognition by peers as sources of creative ideas, suggesting comparatively lower confidence in applying creativity in practical and collaborative contexts. The high mean score and low standard deviation indicate that most students possess strong academic achievement characterized by creativity, intellectual engagement, and problem-solving ability, which are essential for improving academic performance and preparing students for success in higher education and the modern knowledge-based economy.

Table 4 Academic Achievement

n=307	**Mean**	**Std. Dev**
I often come up with bold or unusual ideas.	4.07	0.85
I think about new ideas more frequently than most people.	4.31	0.80
I get excited when I develop a new idea.	4.22	0.88
I can generate many ideas or possible solutions to problems.	4.12	0.74
I am able to think of ideas that others have not considered.	4.13	0.69
I enjoy experimenting with ideas just for fun.	4.02	0.80
I believe it is important to imagine unusual or unconventional possibilities.	4.09	0.78
I would rate myself highly in my ability to generate new ideas.	3.97	0.89
I have always been an active thinker who comes up with many ideas.	3.92	0.78
I enjoy having flexibility and freedom to make my own choices.	3.58	1.11
I would welcome a college course that focuses on developing original ideas.	3.51	1.24
I am able to think deeply and intensely about topics for long periods.	3.95	0.93
I try to exercise my mind by thinking critically and reflectively.	3.44	1.11
I can create solutions to problems that have not been solved before.	3.62	1.09

I am good at combining ideas in new or unexpected ways.	3.50	1.07
Friends often ask me for help when they need creative ideas or solutions.	3.35	1.30
I frequently think of new inventions or ways to improve existing things.	4.30	0.76
My ideas are sometimes considered unusual, impractical, or "wild."	3.97	0.89
I sometimes become so absorbed in a new idea that I ignore other tasks.	3.93	0.84
I occasionally have trouble sleeping because ideas keep coming to my mind.	3.97	0.88
I often shift between ideas when writing or talking because many thoughts come at once.	4.07	0.93
One idea often leads me to another until I forget where the original idea started.	4.20	0.67
Some people see me as absent-minded because I think about many things at the same time.	4.11	0.84
Academic Achievement	3.94	0.55

Assumptions

Regression analysis was used to examine the relationship between artificial intelligence usage, artificial intelligence literacy, academic self-efficacy, and academic achievement, and diagnostic tests were conducted to ensure that the assumptions of regression were satisfied. The normality test using the Shapiro–Wilk statistic showed a non-significant p-value of 0.152, indicating that the residuals were normally distributed. The linearity test results were significant ($p = 0.000$) for all relationships, confirming the existence of linear relationships between academic achievement and AI usage, AI literacy, and academic self-efficacy. The Durbin–Watson statistics ranged from 1.449 to 1.668, indicating no autocorrelation among residuals. The multicollinearity test showed tolerance values above 0.1 (0.593–0.986) and VIF values below 10 (1.014–1.687), confirming the absence of multicollinearity among predictor variables. Additionally, the homoscedasticity test using Levene's test produced non-significant p-values ($p = 0.623–0.778$), indicating equal variance of residuals. Overall, these results confirm that all regression assumptions were satisfied, making the data suitable for regression analysis and hypothesis testing

Correlation Analysis

The correlation results in Table 5 show significant relationships among academic achievement, AI usage, academic self-efficacy, gender, and age. AI usage had a positive and significant relationship with academic achievement ($r = .342$, $p < .01$), while academic self-efficacy showed the strongest positive relationship with academic achievement ($r = .664$, $p < .01$). AI usage was also positively and significantly related to academic self-efficacy ($r = .506$, $p < .01$), indicating that students who used AI more frequently had greater academic confidence. Gender had a weak and non-significant relationship with academic achievement ($r = −.098$, $p > .05$), although it showed weak but significant relationships with AI usage and self-efficacy. Age had a weak but significant positive relationship with academic achievement ($r = .133$, $p < .05$) and AI usage ($r = .206$, $p < .01$), suggesting that older students performed slightly better and used AI more frequently. Overall, the findings indicate that AI usage and academic self-

efficacy are important factors associated with academic achievement, with academic self-efficacy showing the strongest influence.

Table 5 Academic Self-Efficacy

	Student achievement	AI usage	Self efficacy	Gender	Age
Student achievement	1				
AI usage	.342**	1			
Self-efficacy	.664**	.506**	1		
Gender	-0.098	.145*	.201**	1	.131*
Age	.133*	.206**	0.057	.131*	1

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Hypotheses Testing

This study examined whether students' self-efficacy mediates the relationship between artificial intelligence (AI) usage and academic achievement. The mediation analysis was conducted using Hayes' PROCESS Model 4, which enables simultaneous estimation of the direct, indirect, and total effects of AI usage on academic achievement through self-efficacy while controlling for covariates (q1 and q2). This approach provides a deeper understanding of the mechanism through which AI usage influences academic achievement.

The results in Table 6 (Model 1) indicate that AI usage has a positive and statistically significant effect on students' self-efficacy ($\beta = 0.364$, SE = 0.037, $p = 0.000$). This finding suggests that increased use of AI tools enhances students' confidence in their academic abilities. In practical terms, students who frequently use AI technologies such as intelligent tutoring systems, AI-assisted learning platforms, and automated feedback tools are more likely to develop stronger beliefs in their ability to successfully complete academic tasks. The model explained 27.6% of the variance in academic self-efficacy ($R^2 = 0.276$), and the overall model was statistically significant ($F = 38.551$, $p = 0.000$), confirming that AI usage and the covariates jointly predict students' self-efficacy. These findings support Hypothesis H2, which stated that artificial intelligence usage significantly influences students' self-efficacy.

The findings in Table 6 (Model 2) further show that students' self-efficacy has a strong, positive, and statistically significant effect on academic achievement ($\beta = 0.644$, SE = 0.043, $p = 0.000$). This implies that students with higher levels of academic self-confidence tend to achieve better academic outcomes. Self-efficacy enhances students' motivation, persistence, problem-solving ability, and engagement in learning activities, which ultimately contributes to improved academic performance. The model explained 51.2% of the variation in academic achievement ($R^2 = 0.512$), and the overall model was statistically significant ($F = 79.16$, $p = 0.000$), indicating strong explanatory power. Therefore, Hypothesis H3, which stated that students' self-efficacy significantly influences academic achievement, is supported.

Regarding the direct relationship between AI usage and academic achievement, the total effect of AI usage on academic achievement was positive and statistically significant (β = 0.230, SE = 0.036, t = 6.372, p = 0.000), indicating that AI usage initially contributes to improved academic performance. However, when students' self-efficacy was introduced into the model, the direct effect of AI usage on academic achievement became statistically insignificant (β = −0.004, SE = 0.031, t = −0.136, p = 0.892). This change indicates that AI usage no longer directly influences academic achievement when self-efficacy is included in the model. Thus, Hypothesis H1, which stated that AI usage significantly influences academic achievement, is supported at the total effect level but not at the direct effect level after controlling for the mediator.

Most importantly, the indirect effect of AI usage on academic achievement through students' self-efficacy was positive and statistically significant (Effect = 0.234, SE = 0.028, LLCI = 0.182, ULCI = 0.291). Since the bootstrap confidence interval does not include zero, mediation is confirmed. The presence of a statistically significant indirect effect alongside a non-significant direct effect indicates full mediation. This means that AI usage influences academic achievement entirely through its effect on students' self-efficacy rather than through a direct pathway. Therefore, Hypothesis H4, which stated that students' self-efficacy mediates the relationship between artificial intelligence usage and academic achievement, is supported, and the null hypothesis is rejected.

These findings demonstrate that students' self-efficacy is a critical psychological mechanism linking AI usage to academic achievement. While AI tools provide access to information, guidance, and academic support, their true value lies in enhancing students' confidence in their ability to learn and perform academic tasks. Increased self-efficacy encourages greater persistence, motivation, and engagement, which ultimately leads to improved academic performance. Therefore, AI usage enhances academic achievement indirectly by strengthening students' academic self-belief rather than directly improving performance outcomes. This suggests that educational institutions should not only promote access to AI tools but also focus on developing students' confidence and competence in using AI effectively to maximize academic success.

Table 6: Hayes Model 4

	Model 1 (Mediator:)			**Model 2 (Outcome)**		
	β	**SE**	**p**	**β**	**SE**	**p**
Constant	2.607	0.167	0.000	1.58	0.167	0.000
AI Usage	a_1 = 0.364	0.037	0.000	c' = −0.004	0.031	0.892
Self-efficacy	—	—	—	b_1 = 0.644	0.043	0.000
Students age	0.171	0.062	0.006	−0.289	0.047	0.000
Student gender	−0.072	0.057	0.206	0.130	0.043	0.002
R	0.526			0.715		
R^2	0.276			0.512		
F-statistic	38.551		0.000	79.16		0.000

Total, Direct, and Indirect Effects of AI Usage on Achievement

Effect	**Effect**	**SE**	**t**	**p**	**LLCI**	**ULCI**
Total effect (c)	0.230	0.036	6.372	0	0.159	0.301
Direct effect (c′)	−0.004	0.031	−0.136	0.892	−0.066	0.058
Indirect effect ($a_1 \times b_1$)	0.234	0.028	—	—	0.182	0.291

4. Discussion of the Findings

This study examined whether AI usage significantly influences academic achievement among students. The findings showed that AI usage had a positive and significant total effect on academic achievement, indicating that students who frequently used AI tools initially demonstrated better academic performance. However, when academic self-efficacy was included in the model, the direct effect of AI usage became insignificant, suggesting that AI does not directly improve academic achievement but operates through psychological factors such as confidence and motivation. These findings align with previous studies (Khan et al., 2025; Pacheco-Mendoza et al., 2023; Ma'amor et al., 2024; Vieriu & Petrea, 2025), which found that AI improves academic performance by enhancing learning efficiency, understanding, and engagement. This implies that AI contributes to academic achievement primarily through indirect mechanisms rather than direct performance improvement.

The study also examined the effect of AI usage on students' self-efficacy and found a positive and significant relationship, indicating that students who frequently use AI tools develop stronger confidence in their academic abilities. AI tools such as intelligent tutoring systems, writing assistants, and automated feedback enhance students' competence, task efficiency, and perceived academic capability. These findings are consistent with prior research (Ren et al., 2026; Woo et al., 2024; Bećirović et al., 2025; Chen, 2025), which demonstrated that AI usage strengthens students' confidence and competence. This supports Bandura's social cognitive theory, which emphasizes that mastery experiences and effective tool usage enhance individuals' confidence. Therefore, AI usage plays a critical role in improving students' academic self-efficacy.

The study further found that academic self-efficacy had a strong and significant effect on academic achievement, indicating that students with higher confidence in their academic abilities achieved better academic outcomes. Students with strong self-efficacy are more motivated, persistent, and engaged, which enhances their academic performance. These findings are consistent with previous studies (Meng & Zhang, 2023; Musa, 2025; Smith & Al-Amri, 2025; Guo & Tang, 2025), which identified self-efficacy as a key predictor of academic success. This supports social cognitive theory, which emphasizes that confidence influences effort, persistence, and performance. Therefore, self-efficacy is a critical determinant of academic achievement.

The study confirmed that academic self-efficacy mediates the relationship between AI usage and academic achievement. The indirect effect of AI usage on academic achievement through self-efficacy was significant, while the direct effect became insignificant, indicating full mediation. This means that AI improves academic performance by strengthening students' confidence rather than directly influencing

performance. These findings are consistent with prior research (Akter & Rahman, 2025; Zakir et al., 2025; He et al., 2025; Yuan et al., 2024), which found that self-efficacy mediates the relationship between technology usage and academic outcomes. Therefore, AI usage enhances academic achievement indirectly by improving students' confidence, highlighting the importance of promoting both AI adoption and students' self-efficacy in higher education.

5. Conclusions

The findings indicate that the use of artificial intelligence (AI) tools positively enhances students' confidence in their academic abilities. Students who engage regularly with AI technologies, such as intelligent tutoring systems, automated feedback platforms, and AI-assisted learning tools, develop stronger beliefs in their ability to complete academic tasks successfully. This highlights the role of AI usage in fostering academic self-efficacy, emphasizing that confidence is a critical outcome of integrating AI into learning environments. Students' self-efficacy was shown to have a strong positive impact on academic achievement. Those with higher confidence in their abilities were more persistent, motivated, and engaged in learning activities, which translated into better academic performance. This underscores the importance of psychological factors in learning outcomes, suggesting that cultivating self-efficacy can significantly enhance overall academic success.

The study revealed that AI usage contributes indirectly to academic achievement through its effect on self-efficacy. While the direct influence of AI tools on performance was limited, their capacity to build confidence in learning enabled students to achieve better outcomes. This finding highlights the importance of considering psychological mechanisms when assessing the impact of technology on academic performance. Self-efficacy was confirmed as a critical mediator in the relationship between AI usage and academic achievement. The benefits of AI usage on academic outcomes are realized primarily through enhanced confidence, indicating that technology alone is insufficient. Educational strategies should therefore focus on combining AI tools with interventions that strengthen students' belief in their academic abilities.

6. Recommendations

Educational institutions should encourage the use of artificial intelligence tools in learning, as engagement with AI technologies has been shown to enhance students' academic confidence. Schools and universities can provide access to AI-assisted learning platforms, intelligent tutoring systems, and automated feedback tools to support students in developing stronger beliefs in their academic capabilities. Programs and workshops aimed at strengthening students' self-efficacy are recommended, as confidence in academic abilities directly contributes to better learning outcomes. Educators can incorporate strategies such as goal-setting exercises, mastery experiences, and feedback-focused teaching to help students build motivation, persistence, and engagement in learning activities.

Institutions should focus on designing AI learning interventions that indirectly enhance academic achievement through self-efficacy. Rather than relying solely on the presence of AI tools, it is essential to integrate guidance and support mechanisms that help students develop confidence in using these technologies effectively. Curriculum designers should incorporate structured support to ensure that self-efficacy is fostered alongside AI usage. Mentorship programs, peer-assisted learning, and scaffolded AI-

based assignments can reinforce students' belief in their academic abilities while allowing them to benefit fully from technological tools.

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