

SUMMARY:

ETHICAL AI IN HIGHER EDUCATION: EVALUATING STUDIOSITY'S INFLUENCE ON STUDENTS' LEARNING OUTCOMES AT UNIVERSITY OF EDUCATION, WINNEBA.

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Key findings:

- **High student satisfaction:** 94.3% of students expressed satisfaction with Studiosity, citing its usefulness for timely feedback and academic support.
- **Correlation between frequency and academic performance:** There was a significant relationship between the amount of work a student requested feedback (word count) and performance ($p < 0.05$, $p = 0.0002$). "Transparent AI tools that offer detailed feedback often encourage deeper cognitive engagement reflected in higher word counts and better academic outcomes. Thus, interaction depth is a strong indicator of student engagement and performance."
- **Recommendation:** Greater integration of the platform into course delivery, enhanced digital training, improved infrastructure, and stronger safeguards for ethical AI deployment.
- The research also highlights the importance of context-sensitive implementation strategies for AI in African higher education.

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Abstract

This study investigates the impact of Studiosity, an ethical AI-powered academic support platform, on student learning outcomes at the University of Education, Winneba (UEW), Ghana. As the first institution in the country to adopt Studiosity, UEW offers a valuable context for examining the integration of responsible AI in higher education within a resource-constrained setting. A convergent parallel mixed-methods approach was employed, involving data from 773 student survey respondents, system usage logs from 993 active users, and academic performance records. Data analysis combined descriptive and inferential statistical techniques with supervised and unsupervised machine learning algorithms. Additionally, natural language processing was used to analyze open-ended survey responses. The findings reveal high levels of student satisfaction and positive perceptions of Studiosity, with many citing its usefulness in providing timely feedback and academic support. However, inferential analysis showed no statistically significant relationship between perceptions or usage of the platform and academic performance. Machine learning techniques identified three distinct behavioral profiles among users, indicating varied engagement patterns and support needs. Ethical concerns, digital literacy gaps, and unequal access emerged as key challenges to effective and inclusive adoption. Although Studiosity was widely accepted and valued by students, its direct effect on academic outcomes remains inconclusive. The study recommends greater integration of the platform into course delivery, enhanced digital training, improved infrastructure, and stronger safeguards for ethical AI deployment. These findings provide critical insights into responsible AI use in African higher education and highlight the importance of context-sensitive implementation strategies backed by data-driven decision-making.

Keywords: Ethical AI, Studiosity, Learning Outcomes, Higher Education, Machine Learning, Digital Literacy, Sub-Saharan Africa, Educational Technology, Student Engagement, Ghana

1. Introduction

The transformative impact of Artificial Intelligence (AI) on educational systems worldwide has prompted a paradigm shift in the ways students learn, interact with educational content, and receive academic support. With the global movement towards technology-enhanced learning, AI-powered tools are being explored not only for their efficiency and scalability but also for their ability to personalize learning experiences, enhance student outcomes, and support inclusive education (Coppin, 2025; Harry, 2023; Paul et al.; Rasheed et al., 2025).

One such intervention is Studiosity, an ethical AI academic support platform designed to provide personalized formative feedback to students through writing support and subject assistance in real time (Blakey, 2019; Murphy et al., 2022; Pike, 2024).

The University of Education, Winneba (UEW), as a premier teacher education institution in Ghana, has made significant strides in digital transformation, guided by its vision of preparing teachers who are competent, technologically aware, and pedagogically sound. In line with this vision, UEW is the first higher education institution in Ghana to deploy the Studiosity platform across its faculties. Studiosity support students through human- and AI-mediated feedback while aligning with ethical AI principles, transparency, fairness, student autonomy, and privacy (Eltahir & Babiker, 2024). However, evidence on the contextual effectiveness of such platforms in sub-Saharan African educational settings is limited. This research seeks to fill that gap.

The adoption of Studiosity is both timely and strategic, considering the growing demand for scalable, ethical academic support mechanisms amidst challenges such as large class sizes, faculty workload, and varied student preparedness. Despite this promise, several critical questions remain. To what extent does Studiosity improve learning outcomes in a low-resource context? What beliefs, experiences, and sociocultural factors influence its use? Are there any unintended consequences, such as digital exclusion or data privacy concerns, that could undermine its benefits?

This study, therefore, investigates the impact of Studiosity's ethical AI platform on students' learning outcomes at UEW. The research integrates pedagogical theory, ethical AI principles, and advanced data science techniques, including machine learning, to explore how the platform shapes students' engagement, beliefs, academic performance, and technological confidence. It moves beyond traditional metrics to offer a granular understanding of the pedagogical affordances, usage complexity, and contextual barriers associated with ethical AI in education.

The study is underpinned by the Technology Acceptance Model (TAM) and Ethical AI in Education Frameworks. TAM explains user attitudes and intention to adopt technology based on perceived usefulness and ease of use (Davis, 1989). Ethical AI frameworks, as proposed by Morandín-Ahuerma (2023) and Floridi and Strait (2021), guide the study's exploration of fairness, transparency, privacy, and inclusivity. Together, these frameworks inform the research questions, instrument design, and interpretation of findings.

Similarly, Leong and Zhang (2025) argued for ethical guidelines to help students and staff use AI responsibly, addressing misuse and maintaining a transparent and equitable learning environment. Ethical AI principles aim to address issues concerning AI by ensuring transparency, fairness, privacy, accountability, protection of personal data, and maintaining learner autonomy (Khan, 2024). Consequently, it could help students use AI tools responsibly and according to academic integrity practices and values (Nnorom, 2025).

Due to the consequences of the unethical use of AI, guidelines have been proposed for ethical AI in education. For instance, Akmal (2025) proposed an ethical framework comprised of beneficence, non-maleficence, justice, autonomy, and explicability. In addition, UNESCO's ethical issues on AI are human-centered, emphasizing human rights and values laid out in the Universal Declaration of Human Rights (UDHR) to be adopted as the basis for the appropriate use of AI technologies. These principles include safety and security, right to privacy and data protection, transparency and explainability, awareness, literacy, fairness, and non-discrimination (Abrusci et al., 2018).

Transparent AI systems enable users to grasp the decision-making processes behind them, which fosters trust and enhances engagement (Sasikala & Sachan, 2024). These systems improve students' understanding and retention of material by offering clear feedback and personalized learning paths. Luca (2025), emphasize that transparency is a key ethical principle that bolsters trust in AI. Evidence shows that when students understand how AI technologies formulate recommendations or assessments, their confidence in the system increases, leading to greater engagement and improved learning outcomes (Huang et al., 2023; Xu, 2024). Accountability in AI systems plays a crucial role in fostering student trust and engagement. Evidence by Fahmy (2024) shows that students are more likely to engage positively with AI technology when they perceive it as accountable. Chen et al. (2020) found that when educators are held responsible for the effectiveness of AI tools, they are more inclined to assess and modify their instructional strategies based on the feedback provided by the AI.

Privacy and data security concerns have emerged in contexts where many AI applications collect user information (Carmody et al., 2021; Herriger et al., 2025; Paul, 2024; Santos & Radanliev, 2024). Carmody et al. (2021) reported that data privacy and security bias are concerns of AI. Some applications require students'/users' personal information, which can be used for many benefits but can also endanger security.

Therefore, establishing ethical guidelines is essential to ensure data usage aligns with user rights (Herriger et al., 2025). Paul (2024) highlight that without robust privacy protections, students may hesitate to engage with AI tools due to fears of data misuse. This reluctance can undermine the advantages of personalized learning, ultimately impacting learning outcomes.

AI in education can diminish student autonomy, as reliance on automated systems may limit critical thinking and independent learning (Yavich, 2025). Ethical AI should empower students, allowing them to make informed choices rather than being passive recipients of AI-driven content (Merceron & Best, 2024).

Impact of ethical AI on learning outcomes

Artificial intelligence has transformed education by improving students' engagement through an interactive learning enhancement experience to improve learning outcomes (bin Salem, 2024). These enhancements make learning more engaging and efficient, including features like personalization, real-time feedback, automation assessment and teacher-student collaboration, all aimed at reducing users' workload (Langove & Khan, 2024; Qaseem & Ahmed).

Personalized learning experiences tailor educational content to meet learners' needs. They enhance learning by allowing students to learn at their own pace, improving academic performance and boosting engagement. Personalized learning can motivate students by recommending appropriate resources, identifying areas for improvement, and adjusting the difficulty level of tasks. Students can also catch up more easily when struggling with course content (Zhang et al., 2022).

AI's role in automating assessment and grading assessment enables teachers to assign grades to students based on some algorithms in the teacher's absence, while teacher-student collaboration fosters quick feedback and analytics (Limna et al., 2022; Kamalov et al., 2023). This has replaced the traditional human grading system, impacting students' outcomes. Almalki and Mohammed (2022) examined the effect of feedback on quality performance in online math tests and found that immediate feedback significantly improves student outcomes compared to delayed feedback.

Ethical AI transparency is vital in enhancing learning outcomes by fostering trust, engagement, and self-regulation among students (Mohebbi, 2025). Transparency can mitigate concerns about bias and fairness in AI systems.

Hooda et al. (2022) found that students who received transparent feedback from AI systems performed better academically than those who received opaque feedback. Communicating how their performance was assessed allowed students to adapt their study strategies effectively. Hooda et al. (2022) found that students who were informed about the accountability mechanisms behind an AI tutoring system demonstrated higher academic performance than those who were not.

Complexity, Usability, and Digital Readiness

Usability is a major determinant of AI platform adoption. Gyamfi et al. (2025) argues that perceived ease of use and time investment required for onboarding significantly affect engagement rates. While many students find AI features intuitive, others, especially those with limited digital exposure, may struggle with onboarding, thus affecting their experience and outcomes.

Complexity is also tied to perceived usefulness. When students believe that the platform will save them time, improve grades, or make learning easier, they are more likely to use it consistently. However, this depends on adequate training, platform integration into curriculum, and clarity in instructional expectations (Amemasor et al., 2025).

Digital readiness plays a critical role in moderating these perceptions. The literature shows that students from disadvantaged socio-economic backgrounds or rural settings often face barriers such as connectivity issues, lack of training, and limited digital confidence (Samane-Cutipá et al., 2022). These barriers may lead to underutilization of AI platforms, even when the tools themselves are well-designed.

Socio-Cultural Context in AI Adoption

The socio-cultural environment shapes how AI tools are understood and adopted in educational settings. Studies have shown that in many African contexts, technology is seen as a complement to, not a replacement for, traditional teaching methods (Arif, 2025; Wiggill, 2023). This cultural orientation toward teacher-centered instruction influences student expectations and receptiveness to autonomous learning tools like Studiosity.

Additionally, concerns about digital inequality persist. Research suggests that without targeted support, AI may exacerbate existing educational disparities (Rasheed et al., 2025). Students from lower-income households may lack the infrastructure, skills, or confidence to benefit fully from AI platforms. Moreover, if AI tools do not support local languages or culturally relevant content, they risk alienating the very populations they aim to empower.

Gaps in the Literature and Justification for This Study

While there is growing global literature on AI in education, most studies are based in developed countries with established digital infrastructures. There is a significant gap in empirical research from developing country contexts, particularly in Sub-Saharan Africa, on how students perceive, interact with, and benefit from ethical AI tools in higher education.

Few studies have examined the integration of ethical AI platforms within teacher education programmes, a critical sector for cascading digital literacy. Moreover, while previous research has focused on perceptions or performance outcomes, very few have employed machine learning approaches to analyze student data and predict learning behaviors.

This study addresses these gaps by:

- a. Focusing on a Ghanaian university context with unique infrastructural and socio-cultural dynamics.
- b. Combining survey, usage, and performance data for a comprehensive analysis.
- c. Applying machine learning models and NLP to generate predictive and thematic insights.
- d. Exploring how ethical concerns, usability, and socio-cultural factors jointly influence AI effectiveness.

3. Methodology

Research Design

This study employed a convergent parallel mixed-methods research design to investigate the impact of Studiosity's ethical AI platform on student learning outcomes at the University of Education, Winneba (UEW). This design facilitated the simultaneous collection and integration of both quantitative and qualitative data to provide a comprehensive understanding of students' experiences, perceptions, usage patterns, and academic performance in relation to the platform. By incorporating machine learning techniques into the analysis, the study extended its empirical depth, enabling the discovery of latent patterns and predictive relationships that go beyond traditional statistical methods.

The mixed-methods approach was particularly suited to addressing the complex research questions concerning the pedagogical, ethical, and technological dimensions of AI in education, especially within a developing country context.

Study Context and Population

The study was carried out at the University of Education, Winneba (UEW), a leading public institution in Ghana dedicated to teacher education. During the second semester of the 2024/2025 academic year, UEW implemented *Studiosity*, an AI-powered academic support platform designed to provide students with real-time writing feedback and enhance their overall learning experience.

The study targeted undergraduate students from all faculties and academic levels who had access to the platform. However, final-year students (Level 400) were excluded from participation, as they were engaged in off-campus internship programmes during the data collection period. The study focused solely on student users; no faculty members were included as respondents or participants.

Sampling and Participants

A purposive sampling strategy was employed to select students who had interacted with the Studiosity platform at least once during the implementation period. Out of the 1,360 students who registered for the platform, 993 were identified as active users based on system log data. This group of active users constituted the primary sample for both the statistical and machine learning analyses conducted in the study.

Data Collection Methods

The study employed both quantitative and qualitative data collection methods to ensure a comprehensive understanding of students' experiences with the Studiosity platform. Quantitative data were gathered through a structured questionnaire designed to capture students' experiences, beliefs, and attitudes toward ethical AI. The instrument included items on AI familiarity, perceived benefits, usability, ethical concerns, socio-cultural influences, and self-reported academic performance. In addition to survey responses, usage data were obtained directly from the Studiosity platform, capturing metrics such as interaction frequency, feedback turnaround time, and word counts, which served as indicators of engagement. Academic performance data were also collected before and after the platform's implementation to assess changes in learning outcomes, categorized into low, moderate, or high based on institutional grading criteria. To complement the quantitative data, qualitative insights were collected through open-ended survey questions that allowed students to express personal experiences, concerns, and suggestions regarding Studiosity.

Furthermore, focus group discussions were conducted with a diverse group of students across multiple UEW campuses to explore in greater depth their satisfaction, perceived value, challenges, and ethical considerations associated with the platform's use.

Data Analysis

The data analysis involved both traditional statistical methods and advanced machine learning techniques to ensure a comprehensive interpretation of the study findings. Quantitative survey data were analyzed using SPSS and Python libraries. Descriptive statistics were used to summarize students' demographic characteristics, engagement levels with the Studiosity platform, and general perceptions of AI. Inferential statistical techniques were employed to explore relationships among key variables, assess group differences, and determine the extent to which students' perceptions of AI predicted academic performance. To complement these analyses, machine learning algorithms were applied to identify patterns and predictive factors within the data. Supervised learning models were used to predict academic outcomes based on students' responses and platform engagement metrics, while unsupervised learning techniques were employed to uncover underlying behavioral groupings among users. Additionally, natural language processing methods were utilized to analyze qualitative data from open-ended responses and focus group discussions, allowing for the extraction of thematic patterns and sentiment related to ethical concerns, usability, and user experience.

Validity, Reliability, and Trustworthiness

To ensure the rigor and quality of the study, several validation strategies were employed. Content validity was established through expert review of the questionnaire items, followed by pilot testing with a small sample of students to refine clarity and relevance. Reliability of the survey constructs was assessed using Cronbach's alpha, with all major dimensions demonstrating high internal consistency ($\alpha > 0.80$). To enhance trustworthiness, data triangulation was applied by integrating insights from student surveys, Studiosity usage logs, and qualitative feedback from focus group discussions. Finally, to ensure robustness and generalizability of the machine learning models, 10-fold cross-validation was conducted alongside performance comparisons across multiple classifiers.

4. Findings

This section presents the key findings from the study, based on data collected through student surveys, Studiosity usage logs, academic performance records, and open-ended responses.

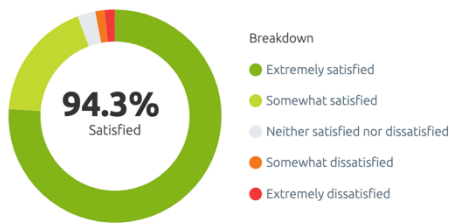
The findings are organized to address the main objectives of the research: examining students' experiences and beliefs about the Studiosity platform, evaluating perceived benefits and pedagogical affordances, identifying challenges and barriers, and assessing the impact of platform usage on learning outcomes.

The results are drawn from quantitative and qualitative sources and supported by descriptive statistics, inferential tests, and machine learning analyses. Patterns of interaction, satisfaction levels, performance correlations, and user perceptions are discussed, providing a detailed account of how Studiosity's ethical AI platform was received and experienced by students at the University of Education, Winneba.

We employed a suite of complementary analytical techniques to ensure a thorough and multidimensional understanding of the data. Descriptive statistics were first used to summarize key features of the dataset, offering an initial overview of trends and distributions across relevant variables. Correlation analysis followed, enabling the examination of the strength and direction of associations between continuous variables, thereby informing the selection of predictors for further modeling. Regression analysis was then conducted to explore the predictive relationships between independent variables—such as demographic or behavioral indicators- and the dependent variable, student engagement. In addition to these inferential methods, we applied K-Means clustering, an unsupervised machine learning algorithm, to identify natural groupings within the data based on shared engagement characteristics. This approach facilitated the discovery of latent patterns that might not be evident through traditional statistical techniques alone. For the benefit of readers less familiar with clustering methods, K-Means works by partitioning data into distinct clusters that minimize intra-group variance, thus providing actionable insight into underlying behavioral typologies.

Overall Summary

Student Satisfaction ⓘ



Sign-ups ⓘ

1,360

Total sign-up

Active Students ⓘ

993

of 0 eligible students
Breakdown

0% of students reached

Student interactions ⓘ

5,774

Total interactions
Breakdown

6 average interactions per student

Figure 1: Shows Studiosity Usage during the duration of the study

94.3% of students are satisfied (combining "Extremely satisfied" and "Somewhat satisfied"), as shown in the doughnut chart. This high satisfaction rate suggests that Studiosity is well-received, with minimal dissatisfaction (only a small portion in "Somewhat dissatisfied" and "Extremely dissatisfied" categories). The breakdown indicates strong positive feedback, which could reflect effective support for UEW's teacher training programs.

A total of 1,360 students have signed up for Studiosity with 993 students are active. This discrepancy between sign-ups and active users (27% drop-off) suggests either low engagement after sign-up. It may indicate a need for better onboarding or awareness campaigns.

There have been 5,774 total interactions, averaging 6 interactions per student. This moderate interaction rate suggests that active users are engaging regularly, possibly for writing feedback or study help, aligning with UEW's academic needs.

The 94.3% satisfaction rate is a strong endorsement of Studiosity's value at UEW, likely supporting students in courses like Educational Technology or Research Methods, where writing and study skills are critical. This could enhance teacher trainees' ability to produce quality assignments. The drop from 1,360 sign-ups to 993 active users highlights a challenge. Factors like limited awareness, technical barriers (e.g., internet access at rural campuses), or lack of perceived need might contribute. UEW could address this through targeted training or integration into the curriculum. The 6 interactions per student indicate moderate usage, possibly reflecting occasional use for specific assignments rather than consistent support. Encouraging regular engagement could maximize Studiosity's impact on learning outcomes.

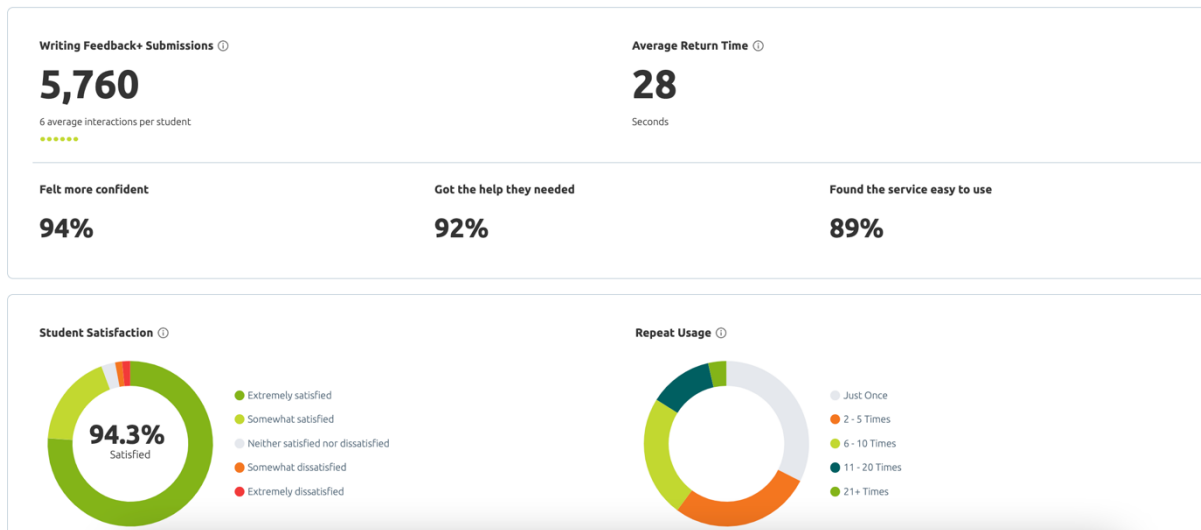


Figure 2: Shows Studioity Usage pattern during the duration of the study

The "Writing Feedback+" metrics for Studioity at the University of Education, Winneba (UEW) reveal a robust engagement pattern, with 5,760 submissions and an average of 6 interactions per student, aligning with the earlier reported 5,774 total interactions and indicating feedback+ as the dominant service, likely driven by its impressive 28-second average return time. Student feedback is overwhelmingly positive, with 94% feeling more confident, 92% getting the help they needed, and 89% finding the service easy to use, which supports the consistent 94.3% satisfaction rate (combining "Extremely satisfied" and "Somewhat satisfied"). The high repeat usage, with significant portions engaging 11–20 times and 21+ times, alongside a small "Just Once" segment, reflects strong reliance on the service among a core group of 993 active students. To build on this, UEW should sustain the efficient return time, address the needs of the small dissatisfied minority, encourage broader use among one-time users with tutorials or incentives, and leverage the 94% confidence gain in marketing to engage the remaining 367 inactive sign-ups.

Analysis on Questionnaire Data

Figure 3 shows the gender distribution of the students of the University of Education, Winneba. The results exhibited a significant gender imbalance with 675 (87.3%) male respondents compared to only 98 (12.7%) female respondents. This skewed distribution may reflect the technology-focused nature of the study population or institutional demographics.

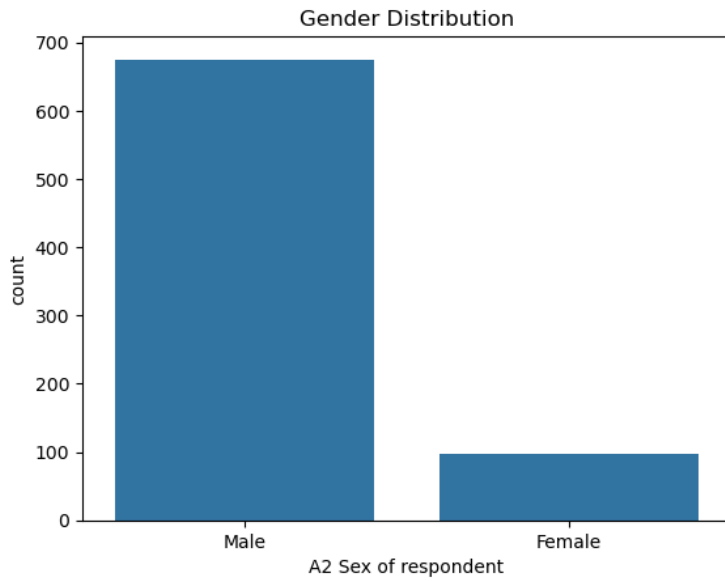


Figure 3: Shows the gender distribution of the students of the University of Education, Winneba.

Figure 4 shows the levels of the students. The results showed that the majority, 480 (62.1%) of the students were in level 200, 155 (20.1%) of them were in level 300 and 138 (17.8%) of the students were in level 100. This gives the implication that, with the exception of level 400 students who were not on campus at the time of the data collection due to their internship, all the levels responded to the items.

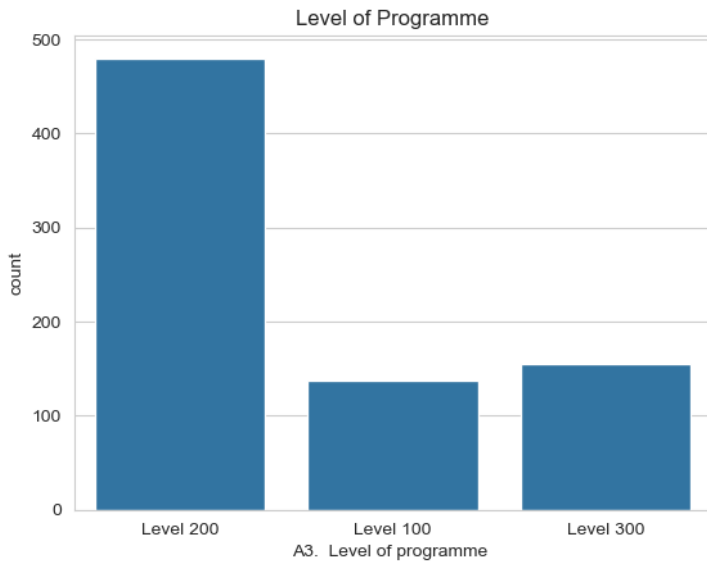


Figure 4: Shows the levels of the students

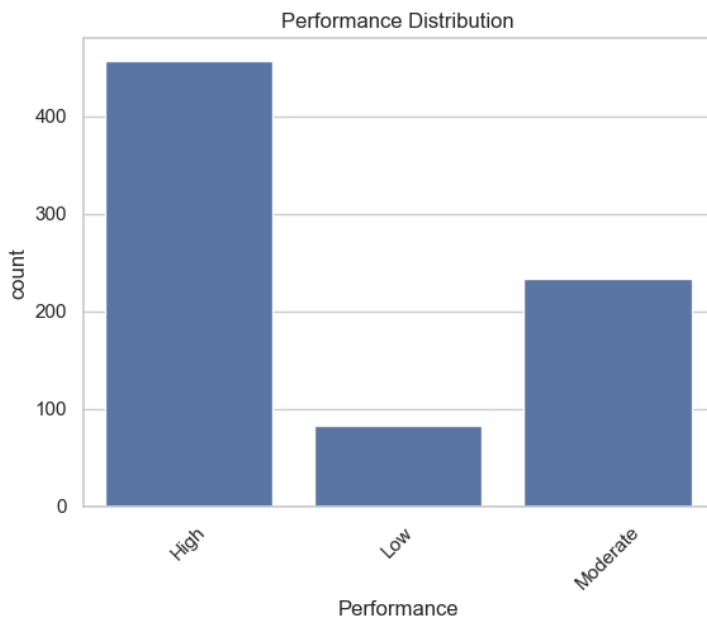


Figure 5: Shows the students' performance distribution which was grouped as low, moderate and high

Figure 5 shows the students' performance distribution which was grouped as low, moderate and high. The results showed 456 had a high performance, 233 performed moderately, and 83 performed poorly.

Table 1: Responses of students on AI Experience and Beliefs

Statement	Agree	Neutral	Disagree
I encounter AI-powered tools in daily learning activities	84.61	14.75	0.65
I believe using AI tools can be a valuable resource for enhancing student learning in my courses	87.06	12.29	0.65
AI is the future for revolutionizing education, work, and daily life	80.47	18.5	1.03
I am comfortable using AI tools for activities like personalized practice or feedback generation, as long as they complement my role as a student	81.5	16.95	1.55
I have been using AI-powered tools to learn	84.35	15.14	0.52
I have good feelings about AI's impact on education	84.99	14.36	0.65
UEW has decided on AI integration in teaching and learning	67.01	28.85	4.14
AI-powered tools can be integrated into teaching in UEW	85.51	13.84	0.65
AI should be integrated in teaching at UEW	82.79	16.43	0.78
There are adequate resources and training to better understand AI in UEW	54.46	37.65	7.89
I have concerns regarding AI and data privacy	57.18	38.42	4.4
I have encountered bias or unfairness in AI systems	33.12	42.17	24.71

Table 1 presents the results of the responses of students on artificial intelligence experience and beliefs. The data reveals overwhelmingly positive attitudes toward AI in education. For instance, 85% of students agreed that they encountered AI-powered tools in daily learning activities, 85% agreed that they have been using AI-powered tools for learning, 85% of them agreed that they had positive feelings about AI's impact on education, and 87 % believed using AI tools can be a valuable resource for enhancing student learning in their courses. While student attitudes are positive, institutional readiness shows mixed results.

This is evident as 67.1% believe UEW has decided on AI integration (lower than personal adoption rates), 83 % think AI should be integrated into teaching at UEW, and 55% of them agreed that there are adequate resources and training to better understand AI in UEW.

Despite positive attitudes, students express legitimate concerns. 57% have data privacy concerns, and 33% have encountered bias or unfairness in AI systems.

Table 2: Perceived Benefits and Applications

Statement	Agree	Neutral	Disagree
Once AI tools are available and approved by the university, it will be safe	73.78	26.22	0
I believe AI adoption can exacerbate existing inequalities (ensure equitable access to AI tools)	58.47	38.16	3.36
AI tools will address teacher shortages	47.22	34.54	18.24
AI tools may lead to job displacement	47.09	32.73	20.18
AI is a tool for improving efficiency	83.7	15.65	0.65
AI is a tool for personalizing learning experiences	83.7	15.27	1.03
AI is an enabler for new technologies in education	83.44	15.91	0.65
I believe that AI can enhance learning outcomes by offering adaptive learning platforms	84.09	15.52	0.39
I believe AI is a powerful tool for solving complex problems	81.50	17.59	0.91
I believe that integrating AI tools into education can help students develop digital literacy and skills	83.05	16.04	0.91
I believe that AI tools can be tailored to support local languages and cultural contexts	66.36	28.98	4.66
I am of the notion that connectivity issues and lack of training will hinder AI tools	64.04	30.79	5.17

Table 2 shows the perceived benefits and applications of Studiosity. Students demonstrated high confidence in AI's educational potential. 84% agreed is a tool for improving efficiency, 84% agreed that AI is a tool for personalizing learning experiences, 84.09% agreed that AI can enhance learning outcomes by offering adaptive learning platforms, and 83.05% believe that integrating AI tools into education can help students develop digital literacy and skills. 64% were of the notion that connectivity issues and lack of training will hinder AI tools, and 58.47% agreed that they believe AI adoption can exacerbate existing inequalities.

Table 3: Perceived Complexity and Usability

Statement	Agree	Neutral	Disagree
Using AI for student support seems like it would require a lot of time and effort for me to learn and implement effectively	42.04	36.22	21.73
Navigating and using the AI features to support my students seems straightforward and user-friendly	69.47	28.07	2.46
The time I spend learning and using AI for students will be significantly outweighed by the time I save in the long run (e.g., grading)	56.02	36.87	7.12

Table 3 shows the responses of the students on perceived complexity and usability. Forty-two percent (42%) of them agreed that using AI for student support seems like it would require a lot of time and effort for me to learn and implement effectively, 69% of them agreed that navigating and using the AI features to support my students seem straightforward and user-friendly and 56% agreed that the time I spend learning and using AI for students will be significantly outweighed by the time I save in the long run.

Table 4: Perceived Pedagogical Affordance

Statement	Agree	Neutral	Disagree
AI tools can personalize the learning experience for students	82.66	16.3	1.03
Feedback systems of AI can provide students with more comprehensive feedback than the traditional approach	71.28	25.23	3.49
AI assistants can handle repetitive tasks such as grading quizzes or providing basic explanations, allowing me to focus on more complex aspects of teaching	78.4	19.66	1.94

Table 4 shows the perceived complexity and usage of Studiosity. From the results, it can be observed that 83% of the students agreed that, AI tools can personalize the learning experience for them, 71% agreed that feedback systems of AI can provide them with more comprehensive feedback than the traditional approach and 78% agreed that AI assistants can

handle repetitive tasks such as grading quizzes or providing basic explanations, allowing me to focus on more complex aspects of teaching.

Table 5: Socio-cultural context

Statement	Agree	Neutral	Disagree
In my cultural background, technology is seen as a tool to enhance, not replace, traditional teaching methods	78.01	19.66	2.33
Colleague students from my socio-economic background might not have access to or the skills necessary to benefit from AI-powered learning tools	54.08	34.54	11.38
The current educational structure might not be readily adaptable to integrate AI into student learning	49.03	34.02	16.95

Table 5 shows the responses of the respondents on Socio cultural context. Table 5 shows that 78 % view technology as enhancing rather than replacing traditional teaching methods, 49.03% believe current educational structures may not readily adapt to AI integration into students learning, and 54.08% agreed that colleague students from their socio-economic background might not have the access or skills necessary to benefit from AI-powered learning tools.

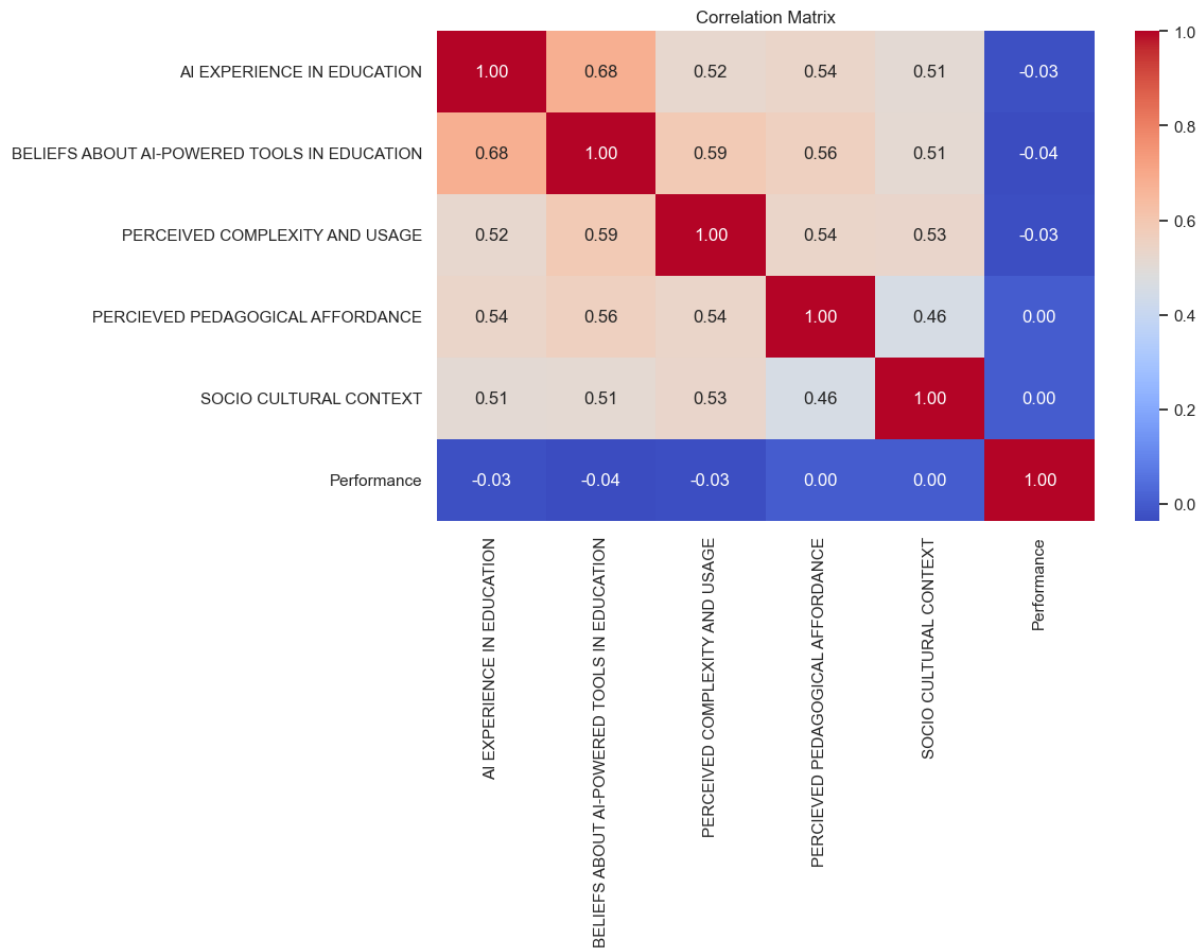


Figure 6: Correlation matrix

The correlation matrix heatmap provides valuable insights into the relationships between various factors associated with AI integration in education, namely: AI experience, beliefs about AI-powered tools, perceived complexity and usage, perceived pedagogical affordance, socio-cultural context, and performance. The analysis reveals strong positive correlations among most of the AI-related variables, suggesting a tightly interlinked ecosystem of experience, perception, and belief.

Specifically, there is a strong correlation ($r = 0.68$) between AI experience in education and beliefs about AI-powered tools. This indicates that individuals who have more exposure to or involvement with AI in educational settings are more likely to hold positive beliefs about its utility and relevance. Similarly, beliefs about AI tools show a relatively strong correlation with perceived complexity and usage ($r = 0.59$), implying that those with favorable opinions about AI tools tend to find them easier to use and more applicable. Additionally, AI experience correlates moderately with both perceived pedagogical affordance ($r = 0.54$) and socio-

cultural context ($r = 0.51$), underscoring the idea that exposure to AI contributes to both a recognition of its teaching potential and its fit within a given social and educational environment.

The socio-cultural context variable also shows moderate positive correlations with all other AI-related factors, ranging from 0.46 to 0.53. This suggests that cultural and contextual factors, such as institutional support, peer influence, and societal attitudes, play a substantial role in shaping how AI tools are experienced, believed in, and utilized within educational settings. These inter-variable relationships paint a picture of a reinforcing network: experience informs beliefs, beliefs influence perceptions of usability, and all are shaped by cultural context.

However, what is particularly notable is the near-zero correlation between all these factors and actual performance outcomes. Correlation coefficients between performance and the other variables range from -0.04 to 0.00, indicating no meaningful linear relationships. This disconnect highlights a critical insight: while educators and learners may increasingly embrace AI tools, this enthusiasm does not directly translate into improved performance. This could be due to a range of underlying issues, including ineffective integration of AI tools into curriculum and assessment, lack of alignment between tool usage and measurable learning outcomes, or the presence of other unmeasured variables influencing performance.

In summary, the matrix illustrates that while the perception and acceptance of AI in education are positively reinforcing, these factors alone are insufficient to drive measurable performance improvements. This calls for more intentional strategies to bridge the gap between technological adoption and learning outcomes. Future research could benefit from a more comprehensive approach, including regression analysis or intervention-based studies, to explore how and when AI tools can be leveraged to enhance educational performance effectively.

Table 6: The key results of the regression analysis

OLS Regression Results							
Dep. Variable:	Performance	R-squared:	0.003				
Model:	OLS	Adj. R-squared:	-0.003				
Method:	Least Squares	F-statistic:	0.5233				
Date:	Sun, 25 May 2025	Prob (F-statistic):	0.759				
Time:	16:17:09	Log-Likelihood:	-1013.4				
No. Observations:	773	AIC:	2039.				
Df Residuals:	767	BIC:	2067.				
Df Model:	5						
Covariance Type:	nonrobust						
		coef	std err	t	P> t	[0.025	0.975]
const		0.7506	0.055	13.535	0.000	0.642	0.859
AI EXPERIENCE IN EDUCATION		-0.0395	0.108	-0.366	0.715	-0.251	0.172
BELIEFS ABOUT AI-POWERED TOOLS IN EDUCATION		-0.0828	0.105	-0.789	0.430	-0.289	0.123
PERCEIVED COMPLEXITY AND USAGE		-0.0465	0.065	-0.719	0.472	-0.174	0.080
PERCEIVED PEDAGOGICAL AFFORDANCE		0.0547	0.069	0.793	0.428	-0.081	0.190
SOCIO CULTURAL CONTEXT		0.0511	0.064	0.797	0.426	-0.075	0.177
Omnibus:	6336.210	Durbin-Watson:	0.013				
Prob(Omnibus):	0.000	Jarque-Bera (JB):	117.092				
Skew:	0.599	Prob(JB):	3.75e-26				
Kurtosis:	1.517	Cond. No.	7.43				

The key results of the regression analysis indicate that the model has very limited explanatory power, with an R-squared value of 0.003 and an adjusted R-squared of -0.003, meaning that only 0.3% of the variance in performance is explained by the predictors. The F-statistic (0.5233) with a p-value of 0.759 further confirms that the overall model is not statistically significant. Analyzing the individual predictors, none of the five variables, AI experience in education ($\beta = -0.039$, $p = 0.715$), beliefs about AI-powered tools ($\beta = -0.082$, $p = 0.430$), perceived complexity and usage ($\beta = -0.047$, $p = 0.472$), perceived pedagogical affordance ($\beta = 0.055$, $p = 0.428$), and socio-cultural context ($\beta = 0.051$, $p = 0.426$), show statistically significant effects on performance. All p-values are well above the 0.05 threshold, indicating that none of these predictors make a meaningful contribution to explaining differences in student performance. These findings suggest that while these variables may influence perceptions or attitudes toward AI in education, they do not independently or collectively predict academic performance in this context.

The Chi-Square Test was used to test for the relationship between Gender and Performance. With a Chi-square value of 7.574 and a p-value: 0.108, it shows that there is not a statistically significant relationship ($p > 0.05$, $p = 0.1085$) between gender and performance. This suggests that performance is independent of gender. This supports prior findings from Ifenthaler & Yau (2024), who emphasized narrowing gender gaps in digital literacy. Despite male dominance in sample size, performance did not vary significantly across gender. This suggests that AI tool usage and outcomes are accessible across genders, given equal opportunity and exposure.

Also using T-test to test for a significant difference between Interactions and Gender, the result $T = 0.1351$, $p = 0.8926$ indicate No significant difference in interactions between males and females. Though males numerically dominate the sample, both genders interact similarly with the platform. This reinforces the earlier finding of performance being gender-neutral, and confirms that engagement with ethical AI is driven more by individual disposition than gender.

With an F-statistic of 5.542 and a p-value of 0.000211 using ANOVA to test for Word Count by Performance, there was a significant relationship between word count and performance ($p < 0.05$, $p = 0.0002$). This indicates that higher-performing students tend to engage more extensively with AI tools. This aligns with the observation in your results where high-performing students engaged more deeply with Studiosity's AI platform. As echoed by Kizilcec et al. (2017), transparent AI tools that offer detailed feedback often encourage deeper cognitive engagement, reflected in higher word counts and better academic outcomes. Thus, interaction depth is a strong indicator of student engagement and performance.

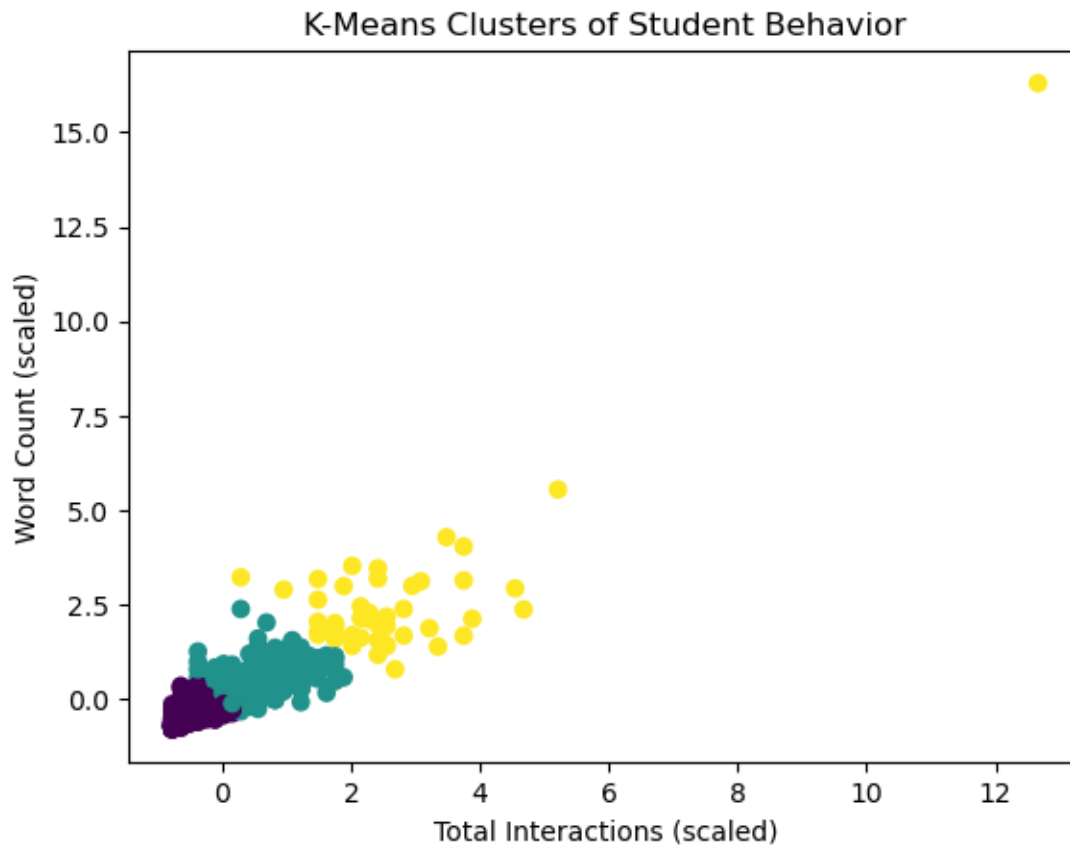


Figure 7: K-means clusters

The unsupervised learning analysis, using clustering algorithms, identified three distinct groups of students based on their interaction patterns and engagement levels with the Studiosity AI platform. These clusters provide valuable insight into how different categories of learners experience and respond to AI in education. Cluster 0, characterized by low interaction and skepticism toward AI, comprises students who minimally engaged with the platform and are likely hesitant or unconvinced of its value. Their low word counts (average ~1170 words) and interaction frequencies suggest limited utilization of the system’s capabilities, potentially due to a lack of training, digital confidence, or perceived relevance. Cluster 1 includes students with moderate engagement but evident ethical concerns. While these students interact more than those in Cluster 0 (average ~4083 words), they remain cautious, likely due to concerns about data privacy, fairness, or transparency—issues already identified in the descriptive results where over half of students expressed unease about privacy and bias. Cluster 2 stands out as the most engaged group, with high interaction levels and positive attitudes toward AI. These students exhibited the highest average word counts (~11,376 words) and frequent interactions with the platform, indicating deep engagement, confidence in the AI system, and possibly higher academic performance. This segmentation

illustrates that while Studiosity’s AI tool holds strong pedagogical potential, its effectiveness is unevenly realized across student groups. The analysis suggests a need for differentiated strategies: targeted support and confidence-building for Cluster 0, transparent ethical assurances for Cluster 1, and enriched, data-informed learning pathways for Cluster 2. Ultimately, this clustering reveals that students are not a homogenous group in terms of AI adoption, and meaningful educational interventions must be tailored to their behavioral profiles and concerns to maximize the benefits of ethical AI integration in learning.

Table 7: Supervised Learning

Model	Accuracy	AUC	Recall	Prec.	F1	Kappa	MCC	TT (Sec)
Gradient Boosting Classifier	0.9090	0.0000	0.9090	0.9090	0.9083	0.8636	0.8642	2.9150
Extreme Gradient Boosting	0.9010	0.9766	0.9010	0.9010	0.9004	0.8514	0.8519	1.1420
Light Gradient Boosting Machine	0.9000	0.9800	0.9000	0.9000	0.8993	0.8500	0.8507	2.7410
Random Forest Classifier	0.8676	0.9642	0.8676	0.8667	0.8661	0.8014	0.8024	1.3220
Logistic Regression	0.8562	0.0000	0.8562	0.8586	0.8563	0.7843	0.7853	2.9300
Decision Tree Classifier	0.7967	0.8475	0.7967	0.7997	0.7972	0.6950	0.6959	0.9440
Linear Discriminant Analysis	0.7943	0.0000	0.7943	0.7969	0.7941	0.6914	0.6926	0.8820
Ridge Classifier	0.7919	0.0000	0.7919	0.7947	0.7916	0.6879	0.6891	0.9180
Extra Trees Classifier	0.7695	0.9172	0.7695	0.7710	0.7686	0.6543	0.6556	1.2380
Naive Bayes	0.7319	0.9276	0.7319	0.7964	0.7350	0.5979	0.6257	0.8070
Ada Boost Classifier	0.6667	0.0000	0.6667	0.4578	0.5390	0.5000	0.5860	1.1620
K Neighbors Classifier	0.5243	0.7165	0.5243	0.5309	0.5248	0.2864	0.2880	0.7750
Quadratic Discriminant Analysis	0.4562	0.0000	0.4562	0.6920	0.3853	0.1843	0.2907	0.7080
SVM - Linear Kernel	0.3743	0.0000	0.3743	0.2894	0.2399	0.0614	0.1169	0.7510

The supervised learning analysis in this study was designed to evaluate the predictive power of various machine learning classifiers in determining students' academic performance based on their interactions with the Studiosity AI platform and related survey responses. The results indicate that several models performed exceptionally well, demonstrating the potential of supervised learning techniques to generate accurate and actionable insights in educational

contexts. The Gradient Boosting Classifier achieved the highest overall performance with an accuracy of 90.9%, precision, recall, and F1-score all above 0.90, and a Cohen's Kappa value of 0.86, indicating excellent agreement beyond chance. This was closely followed by XGBoost and LightGBM, both of which also achieved accuracies of 90.1% and 90.0%, respectively, with high AUC values (XGBoost: 0.9766, LightGBM: 0.9800), reflecting excellent model discrimination ability.

Other high-performing models included the Random Forest Classifier (accuracy = 86.8%, AUC = 0.9642), which also showed good balance in precision and recall, and Logistic Regression, which maintained a respectable accuracy of 85.6% despite its simplicity. These results suggest that ensemble methods—especially boosting algorithms—are particularly effective in capturing complex patterns in student behavior and translating them into accurate predictions of academic outcomes.

Lower-performing models such as the Support Vector Machine (SVM) (accuracy = 37.4%) and K-Nearest Neighbors (KNN) (accuracy = 52.4%) struggled, likely due to their sensitivity to high-dimensional and possibly noisy educational data. The Dummy Classifier, which represents random or majority-class prediction, yielded a baseline accuracy of 33.3%, highlighting how much better the optimized models performed.

Key evaluation metrics such as Recall (true positive rate), Precision (positive predictive value), F1-score (harmonic mean of precision and recall), Cohen's Kappa, and Matthews Correlation Coefficient (MCC) reinforce the robustness of the top models. These metrics show that the models not only achieved high accuracy but were also consistent and reliable across various measures of performance.

The high performance of these models demonstrates that machine learning can successfully leverage behavioral and attitudinal data to predict academic outcomes, even when traditional statistical models (e.g., OLS regression) fail to find significant predictors. This underscores the strength of supervised learning in capturing non-linear, high-dimensional, and interaction effects that may not be evident through standard inferential methods.

From a practical standpoint, these findings suggest that predictive models could be integrated into the Studiosity platform or institutional learning analytics dashboards to identify at-risk students early, recommend personalized interventions, or optimize instructional strategies based on real-time data. However, it is also crucial to consider ethical implications such as model transparency, fairness, and student consent, especially when deploying AI-based prediction systems in educational settings.

Analysis on Interview Guide

The qualitative interviews were guided by a semi-structured interview protocol designed to explore students' familiarity with AI platforms, experiences using Studiosity, perceptions of its benefits and challenges, and concerns about data privacy and training. The questions encouraged reflective responses, allowing participants to share both practical experiences and ethical considerations. A total of 50 interviews were conducted, each lasting approximately 15–20 minutes. The interviews captured diverse student perspectives across different academic levels at the University of Education, Winneba.

The qualitative interviews provided rich insights into students' experiences, perceptions, and concerns regarding the use of Studiosity and similar AI platforms at the University of Education, Winneba. A thematic analysis approach was employed, identifying six key themes aligned with the interview guide. Each theme reveals nuanced aspects of students' engagement with AI in an educational context, highlighting both individual and systemic factors influencing adoption and outcomes.

The findings reveal a generally increasing familiarity among students with AI platforms, especially Studiosity, though this awareness is largely recent and often initiated by the platform's introduction at UEW. Most participants could name Studiosity and a few others like ChatGPT or Grammarly, but their deeper understanding of AI's functions and broader applications remained limited. This indicates that while AI is entering the educational vocabulary of students, sustained engagement and conceptual understanding require deliberate awareness campaigns and sustained exposure. Regarding frequency of use, student engagement with AI platforms appears to be episodic and task-driven. Many respondents reported turning to Studiosity and other AI tools during assignment periods or exam preparations, suggesting a perception of AI as a support system rather than a routine learning aid. This event-based use pattern may be reflective of both limited integration into coursework and students' unfamiliarity with how to leverage AI tools for ongoing academic development.

Students' views on integrating AI into UEW's educational practices were largely positive. They perceived Studiosity as a step forward in enabling personalized learning experiences and easing instructional burdens. However, this enthusiasm was tempered by observations that more infrastructure, support, and structured integration into teaching would be necessary for AI to make a lasting impact. Students seem ready for the technology, but institutional readiness and pedagogical redesign lag behind. Despite the enthusiasm, several challenges emerged around AI feature usability. Many students cited issues with Studiosity's feedback interface, describing it as hard to interpret or navigate. Others noted technical barriers like

unreliable internet connectivity that made platform use inconsistent. These challenges point to the importance of user-centered design in AI tools and underscore the infrastructural limitations that still hamper digital adoption in developing country contexts like Ghana.

Training and support were highlighted as areas of concern. Most students reported minimal or no formal training on how to use Studiosity. Instead, many relied on peer support or trial and error. Those who did receive training described it as rushed, lacking in depth, or inadequate for addressing real-use scenarios. This lack of structured onboarding presents a serious bottleneck in unlocking the platform's full potential and suggests the need for institution-led orientation modules tailored to different levels of digital fluency. Despite the challenges, the benefits of AI platforms like Studiosity were widely acknowledged. Students appreciated the speed of feedback, the support in writing and studying, and the platform's potential to alleviate the workload of lecturers. These responses confirm that when properly used, AI can be a powerful educational ally. However, its impact is most pronounced when aligned with pedagogical needs and student goals.

5. Discussions

This section provides a broader understanding of how students' prior experiences with and beliefs about artificial intelligence (AI) influence their engagement within digital learning environments. Drawing from the rich body of literature reviewed earlier, particularly studies that highlight the impact of technological familiarity, self-efficacy, and attitudes toward AI on learning behaviors, we synthesize the empirical evidence from our analysis to position these constructs within the lived realities of our participants. The data reveal a nuanced interplay between students' confidence in AI tools, their perceived usefulness of such technologies, and their actual engagement levels. Before delving into specific patterns and statistical relationships, it is important to foreground the key message emerging from the data: students' AI-related dispositions are not only shaped by prior exposure but also significantly mediate how they interact with digital platforms for learning.

AI Experience and Beliefs

The findings reveal overwhelmingly positive attitudes toward AI in education among the University of Education, Winneba students. The high agreement rates for AI experience and beliefs (87%) align with recent empirical research. Katsantonis and Katsantonis (2024) found that descriptive statistics revealed that students' attitudes toward AI were mostly positive, as found in a multi-dimensional study of AI attitudes. This positive reception is further supported by Mohammadi and Maghsoudi (2025), who found positive attitudes toward AI in higher

education in a large-scale study (N = 1113) that revealed stakeholders recognize AI's potential to enhance teaching and learning.

The finding that 85% of students encounter AI-powered tools in daily learning activities corresponds with contemporary trends. Campbell University Academic Technology Services (2025) reported that several surveys conducted in 2024 and 2025 revealed that a significant majority of students are using AI in their studies, indicating widespread adoption across higher education institutions globally.

However, the mixed results regarding institutional readiness, with only 67.1% believing UEW has decided on AI integration and 54.46% agreeing on adequate resources and training, reflect broader systemic challenges. Murdan and Halkhoree (2024) documented this institutional lag behind student enthusiasm, suggesting that while students are ready for AI integration, educational institutions may be slower to adapt their infrastructure and policies.

The students' concerns about data privacy (57.18%) and bias in AI systems (33.12%) demonstrate sophisticated awareness of AI's ethical implications. These concerns align with Gaisie et al. (2025) findings on current discourse on AI ethics in education, where skills loss is a real fear: Overreliance on AI could reduce critical thinking and students value the balance between AI tools and human interaction.

Perceived Benefits and Applications

The high agreement rates (84%) for AI's benefits in improving efficiency, personalizing learning, and enhancing outcomes reflect established research on AI's educational potential. Low et al. (2025) found that facilitating conditions and performance expectations positively affect students' attitudes toward AI, which corresponds with the UEW students' positive perceptions of AI's educational applications.

The student's recognition that AI can enhance learning outcomes through adaptive learning platforms (84.09%) aligns with Sari et al. (2024) research demonstrating AI's capacity for personalized education. This finding supports the growing body of evidence suggesting that AI technologies can provide tailored learning experiences that adapt to individual student needs and learning styles.

Notably, the concerns about connectivity issues and lack of training hindering AI tools (64.04%) and the potential for AI to exacerbate existing inequalities (58.47%) reflect critical infrastructure and equity challenges. Umoke et al. reviewed the challenges associated with the digital divide in AI-driven education, including technological infrastructure gaps, socio-

economic barriers, digital literacy deficiencies, and policy constraints, which directly relate to the UEW students' concerns about equitable access to AI technologies.

Perceived Complexity and Usability

The mixed responses regarding AI's complexity and usability reveal important insights about technology adoption barriers. While 69.47% found AI features straightforward and user-friendly, 42.04% felt that using AI would require significant time and effort to learn and implement effectively. This dichotomy reflects the complexity of AI tool adoption in educational settings as documented by Pedro et al. (2019).

The finding that 56.02% believe the time invested in learning AI will be outweighed by long-term benefits suggests a pragmatic approach to AI adoption among students. This cost-benefit analysis approach to technology adoption is consistent with established technology acceptance models documented by Sharit et al. (2004), where perceived usefulness and ease of use are key predictors of adoption intentions.

Perceived Pedagogical Affordance

The strong agreement rates for AI's pedagogical benefits personalization (82.66%), comprehensive feedback (71.28%), and handling repetitive tasks (78.4%) align with research on AI's educational affordances. Rane et al. (2023) found that the integration of Artificial Intelligence (AI) in education has transformed academic learning, offering both opportunities and challenges for students' development, which supports the UEW students' recognition of AI's pedagogical potential.

The students' appreciation for AI's ability to provide personalized learning experiences reflects a key strength of AI in education, its capacity to adapt to individual learning needs and provide tailored support. This finding is particularly significant given the move toward more personalized and adaptive learning environments in higher education as documented by Taylor et al. (2021).

Socio-Cultural Context

The socio-cultural findings reveal important contextual factors affecting AI adoption. The fact that 78.01% view technology as enhancing rather than replacing traditional teaching methods suggests a balanced perspective on AI integration. Okulich-Kazarin et al. (2023) found that students see AI as a tool, not a replacement. They value personalised teacher feedback, discussion, and collaboration alongside AI, which aligns with the UEW students' preference for AI as a complement to traditional approaches.

The concern that 54.08% of students from similar socio-economic backgrounds might not have access to AI tools highlights critical equity issues. Jha and Singh (2025) noted that fear of AI-biased outcomes and negative impacts of AI are stifling the interest in understanding how to use the technology to improve lives, and this digital divide concern is particularly relevant in developing country contexts where infrastructure and resource limitations may create barriers to equitable AI access.

The finding that 49.03% believe current educational structures may not readily adapt to AI integration reflects broader institutional readiness challenges documented by Ali (2023). This suggests that while students are prepared for AI integration, educational institutions may need significant structural changes to effectively incorporate AI technologies into their teaching and learning processes.

6. Conclusion

This study set out to investigate the impact of Studiosity's ethical AI platform on student learning outcomes at the University of Education, Winneba (UEW). It explored student experiences, perceived pedagogical benefits, ethical concerns, socio-cultural considerations, and actual academic performance metrics. Through a combination of survey data, usage logs, academic performance records, and advanced analytical techniques, including machine learning and natural language processing, the study has yielded a multidimensional understanding of how ethical AI is perceived and utilized in a Ghanaian higher education context.

The findings revealed overwhelmingly positive student attitudes toward AI in general and Studiosity in particular. A significant proportion of students believed the platform was useful, easy to use, and capable of enhancing learning through personalized feedback and support. High satisfaction levels, engagement metrics (such as interaction frequency and word counts), and reported confidence gains suggest strong user acceptance and perceived value. However, the analysis also uncovered a disconnect between perception and actual academic performance. Regression and correlation results indicated no statistically significant relationship between AI beliefs, usage, and measurable learning outcomes, suggesting that the impact of Studiosity on performance may be influenced by additional unmeasured variables such as quality of implementation, alignment with coursework, or individual study habits.

The study further identified key barriers to effective utilization of the platform, including concerns over data privacy, digital inequality, and usability for students with limited technical

confidence. Machine learning analysis revealed three distinct user profiles, low-engagement skeptics, moderate users with ethical concerns, and high-engagement adopters, highlighting the need for differentiated support strategies.

Despite these challenges, Studiosity's ethical AI model demonstrated significant promise as a complementary academic support tool. It fostered student autonomy, provided rapid feedback, and promoted digital engagement in a context where faculty-student ratios and academic support services are often stretched. The results underscore the potential for ethical AI platforms to contribute meaningfully to educational access, quality, and equity, provided that institutional readiness, student training, and contextual adaptation are prioritized.

7. Recommendations

Based on the study's findings and conclusions, several key recommendations are proposed to enhance the effectiveness and equitable integration of Studiosity's ethical AI platform at UEW. First, the platform should be embedded directly into curriculum delivery, particularly within writing-intensive courses such as Research Methods and Academic Writing, to ensure consistent use and academic relevance. To address the observed gap between positive perceptions and actual academic performance, students should receive structured guidance on how to apply Studiosity feedback to improve their assignments, study strategies, and critical thinking. Enhancing digital literacy is also essential, particularly for students with limited technological proficiency; orientation programs should include practical training on how to navigate and utilize the platform effectively, with a strong emphasis on academic integrity. Additionally, transparent communication about data use and privacy must be prioritized, with UEW working closely with Studiosity to ensure students understand how their data are handled, in accordance with UNESCO's ethical AI guidelines. To promote digital inclusion, the university should invest in improving internet connectivity across campuses and explore low-data or offline platform functionalities for students in under-resourced areas. Furthermore, behavioral insights derived from machine learning analyses should inform the design of targeted interventions, such as motivational nudges for low-engagement users and advanced support for high-engagement students. Finally, future research should adopt a longitudinal approach to assess long-term academic outcomes and consider incorporating faculty perspectives to better align the platform with instructional goals and overcome potential implementation barriers.

Additionally, we propose several targeted implementation strategies to ensure effective integration of Studiosity into the pedagogical ecosystem of UEW. First, course-level alignment

is essential: integrating Studiosity into the curriculum of writing-intensive and content-heavy courses would foster consistent student engagement and academic relevance. To support this, structured training programmes for both faculty and students must be developed and rolled out regularly, focusing not only on the technical use of the platform but also on its pedagogical utility. These training modules should be embedded into orientation programmes, academic literacy courses, and staff development workshops. To further socialize the platform, departments can be encouraged to champion its use through peer mentoring, departmental demonstrations, and assessment-linked activities. Lessons learned from the pilot highlight the importance of intentional onboarding, continuous support, and ethical safeguards. A key insight is that positive perceptions alone do not translate into academic gains without scaffolded use, digital literacy, and institutional coordination. Looking ahead, UEW must institutionalize ethical AI policies, embed Studiosity into digital pedagogy training for staff and students, and develop monitoring systems to evaluate its long-term educational value. These steps will be crucial in transitioning Studiosity from a novel tool to an integral part of the university's teaching and learning infrastructure.

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