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Effect of Artificial Intelligence Usage on Learning Outcome among Undergraduate Computer Science Students of Tai Solarin Federal University of Education, Ijagun, Ogun State, Nigeria.

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Abstract

This study looked at how computer science students at Tai Solarin Federal University of Education, Ijebu Ode, used artificial intelligence (AI) and how that affected their academic learning outcomes. This study sought to evaluate the effects of AI tools like ChatGPT, GitHub Copilot, and personalized learning platforms on students' comprehension, performance, engagement, and technical proficiency in light of their growing integration into educational environments. 200 undergraduate computer science students were given structured questionnaires as part of a quantitative study approach. Descriptive statistics, Ordinal Logistic Regression (OLR), and Pearson Product Moment Correlation (PPMC) were used to examine the data. According to the findings, most students had favorable opinions of AI and reported better academic achievement, a deeper comprehension of difficult subjects, higher problem-solving abilities, and increased learning efficiency. While worries about relying too much on AI showed weak negative associations with these benefits, correlation analysis revealed considerable positive relationships between various AI-related academic benefits. The regression results also showed that students with excellent digital literacy and self-confidence were less likely to feel dependent on AI technology, even when intensive AI usage may increase dependency. The study comes to the conclusion that, when used properly, AI tools improve academic achievement. To avoid over-reliance, it suggests integrating AI into the curriculum in an organized manner, improving digital literacy, and encouraging critical thinking. This study contributes to the growing discourse on AI in education and lays the groundwork for institutional policies and instructional design.

Keywords: Artificial Intelligence, Academic Learning Outcomes, AI Tools

Introduction

The rising use of artificial intelligence (AI) in educational settings has both opportunities and challenges for students' academic achievement. AI tools are being used in Nigerian higher education institutions, to improve learning results, especially for computer science students. Recent research has demonstrated how AI improves students' academic achievement. For example, Ngonso et al, (2025) surveyed tertiary institutions in Nigeria and discovered that most students use AI technologies, which have improved their academic performance. According to the study, AI improves students' comprehension of their classes, sharpens their speaking and learning abilities, and makes difficult technical subjects easier to understand. To optimize its advantages and handle ethical issues, the researchers advise instructors and students to receive formal training on the use of AI in the classroom. Similarly, Opara and Badamasi's (2024) study investigated the effects of AI-powered personalized learning platforms on the academic achievement and motivation of senior secondary school students in Abuja. The findings demonstrated that these platforms significantly improve academic performance and positively affect students' motivation, suggesting that AI could be a helpful tool in computer science education. However, there are drawbacks to using AI in the classroom. Aruleba et al. (2023) conducted a study to find out what students thought about using



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ChatGPT and other AI technologies in computer science lectures. While acknowledging that AI has the potential to enhance learning, students expressed concerns that an over-reliance on AI could have a detrimental effect on their capacity for critical thought and problem-solving. This highlights how important it is to find a balance between using AI and traditional teaching methods to ensure the development of vital cognitive skills. It is essential to comprehend how AI usage affects computer science students' academic performance in the setting of Tai Solarin Federal University of Education. It is crucial to evaluate how AI tools affect students' learning outcomes, critical thinking, and general academic performance as they are increasingly incorporated into teaching methods. In order to provide insights that can guide the creation of tactics to maximize AI integration in computer science education, this study attempts to investigate these processes. Students studying computer science at Tai Solarin Federal University of Education (TASFUED), which is renowned for its dedication to technical innovations in education, are increasingly utilizing AI technologies. These students employ AI for a variety of academic tasks, such as algorithm development, programming, research, and data analysis. AI's incorporation into their educational process could improve academic achievement, increase productivity, and open up new avenues for creativity. But even with these benefits, there are still issues with ethics, an excessive dependence on AI, and how it impacts pupils' capacity for critical thought and problem-solving. A number of important problems are brought up by the growing usage of AI in education: How does AI affect students' academic performance? How much do students rely on AI to do their assignments? Does AI make them more proficient programmers or make them more dependent? Does the use of AI raise ethical issues like academic dishonesty? Understanding the wider ramifications of AI adoption in computer science education requires addressing these issues.

Objectives of the Study

This study's primary goal was to look into how computer science students at Tai Solarin Federal University of Education in Ijebu Ode were affected by the use of artificial intelligence.

The specific objectives of this study are:

1. To analyze the extent of AI adoption among Computer Science students at TASUED within the next six months.
2. To use a survey of at least 200 students to determine how AI tools affect students' academic performance
3. To identify the most commonly used AI applications and their effectiveness in learning Computer Science courses.
4. To determine how AI influences students' problem-solving and programming skills within a semester.
5. By the end of the academic year, assess the difficulties and moral issues related to the use of AI in educational activities.

This study is significant for several reasons, one of which is that it contributes to the growing body of knowledge about artificial intelligence (AI) in higher education, particularly in the context of a developing country like Nigeria.

- i. The results would allow Tai Solarin Federal University of Education (TASFUED) computer science students comprehend how AI tools may be used to improve their academic learning outcomes. Additionally, it can encourage the ethical and responsible application of AI in their research.
- ii. By offering insights into how AI affects student performance, the study would assist instructors and curriculum designers in incorporating pertinent AI tools into instructional techniques to raise student engagement and academic achievement.



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- iii. Decision-makers would find the research to be a useful tool for developing policies and allocating funds for the institution's adoption of AI technology in teaching and learning procedures.
- iv. For other academics interested in investigating the relationship between AI and education, particularly in the context of Nigerian or African higher education, the paper would be a useful resource.
- v. The study can help developers create AI tools that are suited to university students' academic requirements and learning styles, particularly those who are majoring in computer science.

This study aims to examine the effects of artificial intelligence (AI) on computer science students' academic learning outcomes at Tai Solarin Federal University of Education (TASUED), Ijebu Ode. The participants were undergraduate students enrolled in the Department of Computer Science for the academic year 2024–2025.

Research Questions

1. To what extent do Computer Science students at TASUED utilize AI in their academic activities?
2. How does AI usage impact students' academic performance in Computer Science Courses?
3. What are the most commonly used AI tools by students, and how effective are they?
4. In what ways does AI influence students' problem-solving and programming skills?
5. What challenges and ethical concerns do students face in using AI for academic purposes?

Research Hypotheses

H₀: There is no significant relationship between the use of Artificial Intelligence (AI) tools and the academic learning outcomes of Computer Science students at Tai Solarin Federal University of Education, Ijagun.

Literature Review

This chapter presents the review of studies related to Artificial Intelligence (AI). AI is increasingly integrated into educational settings, offering both the present study. It was done under the opportunities and challenges for students' academic performance. This literature review examines the following sub-headings:

Positive Impacts of AI on Academic Performance

Several studies highlight the beneficial effects of AI in education:

- i. Personalized Learning: AI-powered platforms can tailor educational content to individual student needs, enhancing engagement and understanding. For instance, adaptive learning systems have been shown to improve student test results by 62% (Holmes, Bialik, & Fadel, 2019).
- ii. Enhanced Learning Efficiency: The integration of AI tools in science education has consistently improved students' academic performance, suggesting that AI can make learning processes more efficient.
- iii. Predictive Analytics: Machine learning techniques have been applied to predict student performance, allowing for early intervention and support. Studies indicate that student achievement can be accurately forecasted using these methods.

Challenges and Considerations

Despite these advantages, the adoption of AI in education presents certain challenges:

- i. Skill Development: Over-reliance on AI tools may hinder the development of critical thinking and problem-solving skills. It is essential for students to engage deeply with the material rather than depending solely on AI assistance



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- ii. Assessment Integrity: The use of AI in completing assignments raises concerns about academic integrity. Instances have been reported where students faced disciplinary actions for misusing AI tools in their coursework
- iii. Resource Availability: Effective implementation of AI requires adequate infrastructure and training. Institutions must ensure that both students and faculty are equipped to utilize AI technologies effectively.

Relevance to Nigerian Educational Context

In the Nigerian educational landscape, AI's impact has been explored with promising results:

- i. Student Performance: Research indicates that AI positively influences Nigerian students' educational performance by enhancing their understanding of course material and improving learning outcomes
- ii. Administrative Efficiency: AI applications have been found to improve university administration and academic staff performance, contributing to a more effective educational environment.

The integration of AI in computer science education offers significant potential to enhance academic effectiveness. However, it is crucial to address challenges related to skill development, assessment integrity, and resource availability. For institutions like Tai Solarin University of Education, adopting AI requires a balanced approach that leverages its benefits while mitigating potential drawbacks. The integration of Artificial Intelligence (AI) in educational settings has garnered significant attention, particularly concerning its impact on students' academic learning outcome. In the context of Nigerian tertiary institutions, including Tai Solarin University of Education in Ijebu Ode, understanding how AI influences computer science students' academic effectiveness is crucial.

Adenubi (2013) developed an Artificial Neural Network (ANN) model to predict the final grades of computer science students at Tai Solarin Federal University of Education. The study utilized data from thirty randomly selected students who had completed four academic sessions. The ANN model achieved a prediction accuracy of 92.7%, demonstrating the potential of AI in forecasting academic outcomes. Similarly, Lateef and Bamidele (2015) employed an ANN model to predict students' academic performance in a university system. Their research focused on sixty students from the Department of Computer Science at Tai Solarin University of Education. The model accurately predicted final grades with a 91.7% accuracy, highlighting the efficacy of AI in educational predictions. Ngonso et al. (2025) conducted a survey across Nigerian tertiary institutions, finding that AI enhances students' understanding of their courses, improves learning and speaking skills, and simplifies complex technical concepts. The study recommends formal training for both students and teachers on the academic use of AI to maximize its benefits and address ethical considerations. However, the adoption of AI in education also presents challenges. Abubakar et al. (2024) explored the impact of AI technologies on academic performance and the challenges they pose to accurately evaluating student capabilities. The study emphasizes the need to redefine assessment methods to maintain academic integrity in the face of increasing AI integration. A study by Okekeokosisi et al. (2024) examined the impact of AI-based activities on students' interest in computer science education in South East Nigerian universities. The findings indicated that incorporating AI-based activities significantly increased students' interest and engagement in computer science courses, suggesting that AI can be a valuable tool in enhancing motivation and participation in the field. In a systematic literature review, Opara and Badamasi (2024) assessed the impact of AI-powered personalized learning platforms on computer science students' academic achievement and motivation. The study concluded that such platforms positively influence academic performance and motivation,



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highlighting the potential of AI to tailor learning experiences to individual student needs. In summary, while AI offers promising tools to enhance learning and predict academic performance, it is essential to balance its use with traditional educational methods. This balance ensures the development of critical thinking and problem-solving skills among students. Further research is necessary to explore the optimal integration of AI in educational contexts, particularly in institutions like Tai Solarin University of Education.

Artificial Intelligence in Higher Education

AI has become an integral part of modern education systems, especially in higher institutions. According to Holmes et al. (2021), AI applications in education include chatbots for student support, learning analytics, plagiarism detection tools, and AI-driven recommendation systems. These technologies help educators tailor instruction to individual learners' needs and pace, which is especially beneficial in technical fields like Computer Science.

AI and Academic Performance

Several studies suggest a positive correlation between AI tool usage and improved academic performance. For example, Chen et al. (2020) found that students using AI-powered learning platforms showed significant improvement in test scores compared to those in traditional classrooms. Similarly, Al-Faryan and Alsadoon (2022) observed that adaptive learning systems that use AI to analyze student data and adjust instructional content led to higher retention rates and deeper understanding among Computer Science undergraduates.

AI in Nigerian Higher Education Context

In Nigeria, the adoption of AI technologies in education is still emerging, with varying levels of implementation across institutions. Adebayo and Olamide (2021) reported that while awareness of AI is growing among university students, actual usage for academic purposes is often limited due to infrastructural and financial constraints. Nevertheless, where AI tools are accessible, students report improved motivation and better comprehension, particularly in science and technology disciplines.

Relevance to Tai Solarin University of Education

Tai Solarin University of Education (TASUED), being a specialized university of education with a strong focus on technology integration, provides a suitable context to examine AI's impact on academic outcomes. According to Ogunlade and Adeyemi (2022), Computer Science students at TASUED are increasingly exposed to AI concepts and tools, both in curriculum content and in supplementary learning environments. This trend presents an opportunity to study how such exposure translates into measurable academic achievements.

Challenges and Gaps

Despite the potential benefits, challenges such as inadequate training for lecturers, poor internet connectivity, and limited access to advanced AI tools persist in many Nigerian institutions (Okonkwo & Okoye, 2020). Additionally, there is a lack of empirical research specifically focusing on the impact of AI usage on learning outcomes within Nigerian universities, particularly at TASUED. This gap underscores the importance of conducting localized studies that consider contextual factors affecting AI adoption and educational effectiveness. The reviewed literature highlights the transformative potential of AI in enhancing students' academic learning outcomes, particularly in fields that require computational thinking and problem-solving. While global studies indicate generally positive results, local contexts like TASUED demand more targeted investigations. Understanding how AI tools affect



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Computer Science students' learning outcome in this specific setting will contribute to both academic literature and institutional policy-making.

AI-Driven Personalized Learning and Tutoring Systems

Artificial Intelligence technologies offer the possibility of personalized learning pathways, which have become a major focus in contemporary educational research. AI systems can adjust the level of content difficulty, pace, and style of instruction to match individual learning styles and progress rates (Woolf, 2020). Systems like Intelligent Tutoring Systems (ITS) and Learning Management Systems (LMS) equipped with AI features have been proven to significantly enhance understanding and retention of content, particularly in technical disciplines such as Computer Science (VanLehn, 2011). For instance, an empirical study by Kazi et al. (2021) demonstrated that AI-based tutoring systems led to improved performance in algorithm-related tasks for undergraduate Computer Science students. This result supports the notion that AI can reduce the cognitive load associated with complex topics by offering real-time hints, feedback, and scaffolding.

Student Attitudes and Acceptance of AI Tools

According to Davis et al. (2022), the Technology Acceptance Model (TAM) indicates that perceived usefulness and ease of use are strong predictors of whether students will adopt AI tools for learning. In the Nigerian context, research by Eze et al. (2023) found that computer science students in universities were generally open to AI applications, but adoption was limited in some cases by low digital literacy and a lack of technical infrastructure. At TASUED, preliminary surveys by Adebajo and Odusanya (2022) revealed that most students had a positive attitude towards AI usage in their coursework, particularly for programming assistance, code reviews, and simulation-based learning. However, students also expressed concern about over-reliance and potential for academic dishonesty.

Ethical and Pedagogical Implications of AI Use

While AI enhances academic performance, it also raises ethical and pedagogical concerns. Binns et al. (2018) cautioned against the risk of bias and lack of transparency in AI decision-making, particularly in automated grading and recommendation systems. Furthermore, Selwyn (2019) argues that AI could deskill educators by shifting instructional responsibilities to algorithms, potentially weakening pedagogical relationships. These concerns are particularly relevant in teacher-training institutions like TASUED, where educators are trained not only to use technology but also to critically assess its impact on the learning process. As Ogunbanjo and Faleye (2023) point out, future teachers must be equipped to integrate AI responsibly, balancing automation with human-centered teaching approaches.

Readiness and Infrastructure for AI Implementation in Nigerian Universities

One of the recurring themes in the literature is the infrastructure gap in deploying AI tools effectively in Nigerian higher education. According to Aina and Bello (2021), major obstacles include unreliable electricity, poor internet connectivity, and lack of access to advanced computing resources. These challenges often limit the scalability of AI-driven educational interventions. However, institutions like TASUED are beginning to bridge this gap through partnerships and investments in digital infrastructure. As part of its Smart Campus Initiative, TASUED has introduced cloud-based learning platforms and initiated training programs for lecturers on AI integration (Taiwo et al., 2023). This institutional commitment provides a unique opportunity to study the outcomes of AI usage in a resource-constrained but progressively digital environment.



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Comparative Studies and Global Trends

Globally, universities in countries like the United States, China, and Finland have implemented large-scale AI interventions in Computer Science education. For example, Finland's "AI in Education" national initiative has demonstrated how early exposure to AI concepts improves students' analytical and computational thinking (Vuorikari et al., 2022). Comparing these efforts with Nigerian universities provides insight into best practices and contextual adaptations needed for local success.

Appraisal of Literature

Although global research shows a clear positive trend in AI's influence on learning outcomes, localized, institution-specific studies—especially in African settings—remain limited. In the context of TASUED, empirical data linking AI tool usage to measurable academic improvements among Computer Science students is sparse. Filling this gap will offer practical recommendations for policy and practice at both institutional and national levels.

Methodology

This section describes the population, sample and sampling strategy, research instrument, validity and reliability of the instrument, data gathering protocol, and data collection method. This study uses a descriptive survey research methodology to examine how the use of artificial intelligence (AI) affects computer science students' academic learning outcomes at Tai Solarin Federal University of Education (TASUED), Ijebu Ode. Because it enables the gathering of comprehensive data from a particular population at a certain moment in time, the descriptive survey design is suitable for this study. It also enables the researcher to analyze patterns, relationships, and perceptions related to AI usage and academic learning outcome among students. The study uses a quantitative approach, relying primarily on structured questionnaires to gather data from respondents. The responses were statistically analyzed to determine the extent to which AI usage influences academic learning outcomes. Additionally, a correlational analysis was employed to examine the relationship between variables such as frequency of AI tool usage, types of tools used, and academic learning outcomes (e.g., GPA or self-reported grades). The following procedures were followed in order to investigate how the use of artificial intelligence (AI) affected computer science students' academic learning results at Tai Solarin Federal University of Education (TASFUED), Ijebu Ode: The researcher obtained necessary approvals from the university's Department of Computer Science and the relevant ethics committee to ensure the study meets ethical standards, including informed consent and confidentiality. A structured questionnaire was designed to collect data on the types, frequency, and purposes of AI tool usage, as well as students' academic performance and perceptions of AI effectiveness. The questionnaire undergoes expert review and pilot testing to ensure clarity and validity. TASFUED undergraduate computer science students make up the target population. To guarantee representation across various levels, a sample was chosen using stratified random sampling (e.g., 100–400 level students). The validated questionnaires were being distributed to the selected participants electronically (e.g., via Google Forms). Instructions on how to complete the form was clearly communicated to ensure accurate responses. The questionnaire undergoes expert review by educational experts and computer science lecturers to ensure clarity, relevance, and accuracy. Cronbach's Alpha was employed to assess the instrument's reliability in a pilot study with thirty students who were not part of the main sample, guaranteeing a consistency score more than 0.7. Pearson Product Moment Correlation (PPMC) was used to examine relationships between AI usage and academic learning outcome. Ordinal Logistic Regression analysis determines the impact of AI usage on students' problem-solving and programming skills.



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Presentation of Results

The data gathered on the impact of artificial intelligence (AI) use on the academic learning outcomes of computer science students at Tai Solarin University of Education, Ijebu Ode, is analyzed and interpreted in this chapter. Structured questionnaires were used to collect the data from a sample of Department of Computer Science undergraduate students. The research goals and hypotheses developed in previous chapters serve as the framework for the analysis. The association between the employment of AI technologies and students' academic learning results is examined using both descriptive statistics (such frequency, percentage, and mean scores) and inferential statistics (like hypothesis testing). For clarity, the results are displayed in tables and charts, and then interpretations based on the study's context are provided.

A five-point Likert scale, spanning from Strongly Disagree (0) to Strongly Agree (4), was used to examine the responses gathered from Tai Solarin University of Education computer science students. The majority of respondents had favorable opinions about using AI in their academic learning processes, according to the descriptive statistics compiled in Table 1.

Table 1: Descriptive Statistics of the Dataset

Variable (Shortened)	Mean	Std Dev	Min	25%	Median	75%	Max
Understanding academic concepts using AI	4.02	0.79	1	4	4	4	5
Academic performance improved since using AI	4.02	0.79	1	4	4	4	5
AI-enhanced learning is engaging	4.14	0.60	2	4	4	4	5
AI provides personalized academic support	4.02	0.79	1	4	4	4	5
AI improves logical thinking in problem-solving	3.95	0.95	1	4	4	4	5
Confident tackling programming tasks with AI	3.95	0.88	1	4	4	4	5
AI improves code quality	3.88	0.80	2	4	4	4	5
AI improves problem-solving and programming skills	3.98	0.77	1	4	4	4	5
AI reduces time spent searching for academic resources	3.93	0.85	1	4	4	4	5
AI increases academic productivity	3.83	0.94	1	4	4	4	5

Specifically: Over 70% of students agreed or strongly agreed that AI tools helped them understand academic concepts more easily. A significant proportion reported improvements in academic performance, enhanced problem-solving skills, and increased academic performance. Increased productivity as a result of AI support. These findings suggest a generally positive perception and high acceptance of AI technologies among the student population.

Visualization of Likert-Scale Responses

Figure 1 presents a Likert-scale dot plot with box plots, summarizing students' responses categorized under four key themes:

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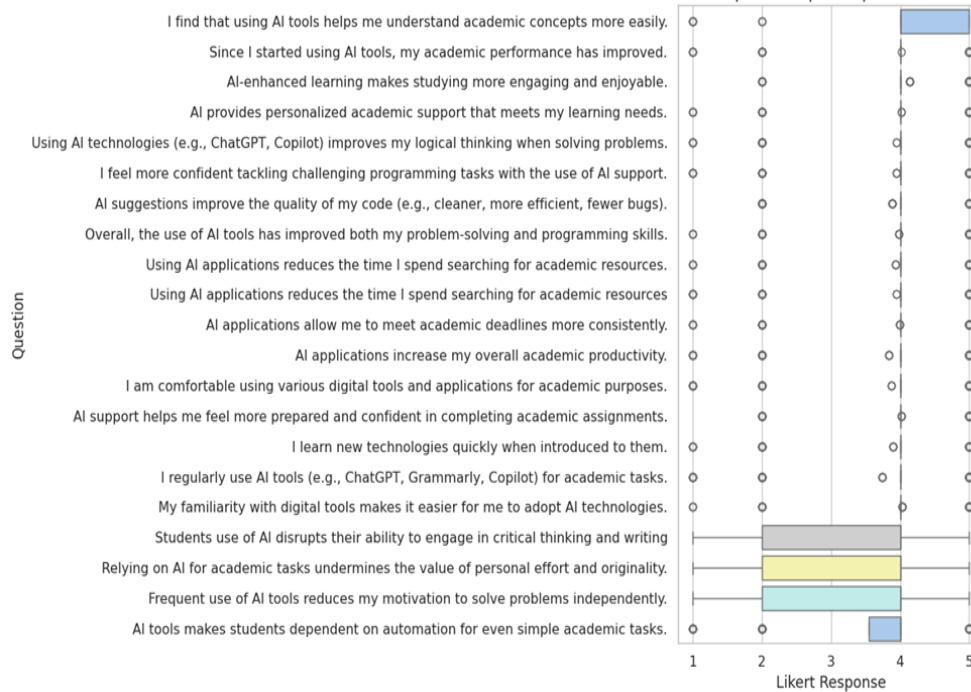


Figure 1: Likert-Scale Dot Plot of Students

Overall Positive Attitudes Toward AI Usage

Statements such as:

- “I find that using AI tools helps me understand academic concepts more easily.”
- “Since I started using AI tools, my academic performance has improved.”
- “AI-enhanced learning makes studying more engaging and enjoyable.”
- “AI improves my problem-solving and programming skills.”

Most responses clustered around values 4 and 5, with narrow box plots indicating low variability and high consensus. This demonstrates a strong positive reception of AI-enhanced learning tools.

AI Use and Technical Skills Development

Statements included:

- “Using AI technologies improves my logical thinking.”
- “AI suggestions improve the quality of my code.”
- “I feel more confident tackling programming tasks with AI.”

Responses again clustered toward the high end of the Likert scale, indicating perceived improvements in technical and problem-solving abilities, aligning with key learning outcomes.

Technological Confidence and Usage

Statements such as:

- “I regularly use AI tools (e.g., ChatGPT, Copilot).”
- “My familiarity with digital tools makes it easier to adopt AI.”
- “I am comfortable using various digital tools.”

Box plots for these questions were tightly grouped, suggesting that students are digitally literate and face few barriers in adopting AI tools.



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Concerns About Overreliance on AI

Statements such as:

- i. "Students' use of AI disrupts critical thinking and writing."
- ii. "Frequent use of AI reduces motivation to solve problems independently."
- iii. "AI tools make students dependent on automation."

Here, responses were more widely distributed, with box plots centered around 3, indicating mixed opinions. While many students value AI, there is concern over dependency and diminished critical thinking.

Result of Pearson Product Moment Correlation (PPMC)

As shown in Figure 2, the PPMC displayed the linear relationship between features of the questions in the questionnaire. With the color scale ranges from -0.8 (dark blue, strong negative correlation) to 1.0 (dark red, strong positive correlation), with 0 (light blue) indicating no correlation and the diagonal (e.g., question1 to. question1, question2 to. question2) shows a correlation of 1.00 (perfect correlation), as expected since each question is correlated with itself.

Strong Positive Correlations (0.5 to 1.0)

Several pairs of questions show strong positive correlations (highlighted in shades of orange to red), indicating that participants who rated one question highly tended to rate the other highly as well.

Notable Clusters of Strong Correlation:

These question1 to question14 (Positive Perceptions of AI Tools) focus on the positive impacts of AI tools, such as improving academic performance, engagement, problem-solving skills, and productivity. For instances question 9 ("Using AI applications reduces the time I spend searching for academic resources") and question 10 (same question, duplicated in the dataset) have a correlation of 1.00, which is expected due to the duplication. And question 11 ("AI applications allow me to meet academic deadlines more consistently") and question 12 ("AI applications increase my overall academic productivity") have a correlation of 0.56, suggesting that students who find AI helpful for meeting deadlines also tend to feel more productive overall.

Likewise, question 5 ("Using AI technologies improves my logical thinking when solving problems") and question 6 ("I feel more confident tackling challenging programming tasks with the use of AI support") show a correlation of 0.52, indicating that AI's role in enhancing logical thinking aligns with increased confidence in programming tasks. Question 15 to question 17 (Technology Adoption and Comfort) have a correlation of 0.53, suggesting that students who adapt quickly to new technologies also find it easier to adopt AI tools due to their familiarity with digital tools. In summary, these strong correlations suggest that students who perceive AI tools as beneficial in one area (e.g., productivity) are likely to see benefits in related areas (e.g., meeting deadlines, improving problem-solving).

Weak to Moderate Positive Correlations (0.1 to 0.5)

Figure 4.2, most pairs of questions show weak to moderate positive correlations (light orange to light blue), ranging from 0.1 to 0.5. Question 1 ("I find that using AI tools helps me understand academic concepts more easily") and question 3 ("AI-enhanced learning makes studying more engaging and enjoyable") have a correlation of 0.24. This suggests a mild relationship where students who find AI helpful for understanding concepts also tend to find it engaging, but the connection is not very strong. And question 7 ("AI suggestions improve the quality of my code") and question 8 ("Overall, the use of AI tools has improved both my problem-solving and programming skills") have a correlation

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of 0.42, indicating a moderate relationship between perceived improvements in code quality and overall skill enhancement.

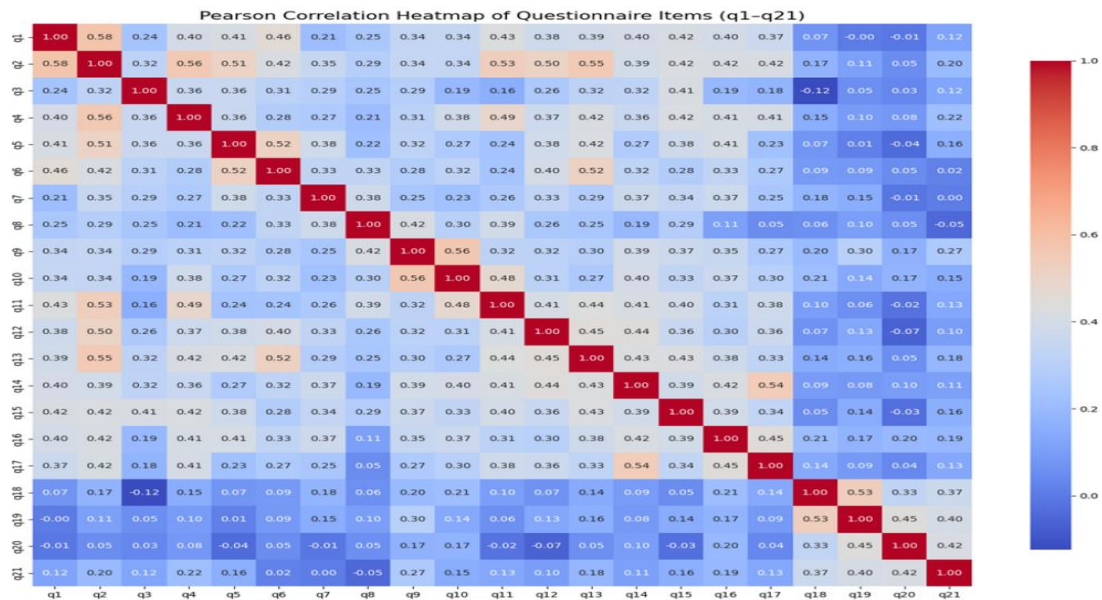


Figure 2: Heatmap of Pearson Product Moment Correlation (PPMC)

Negative Correlations (0 to -0.8)

Questions 18 to question 21 focus on potential downsides of AI usage, such as reduced critical thinking, originality, motivation, and increased dependency. Questions in class show weak negative correlations with question 1 to question 14 (positive perceptions of AI). For instance, question 18 ("Students' use of AI disrupts their ability to engage in critical thinking and writing") has a correlation of -0.12 with question 1 ("I find that using AI tools helps me understand academic concepts more easily"). This suggests that students who find AI helpful for understanding concepts are slightly less likely to believe it disrupts critical thinking, though the relationship is weak. While the strongest negative correlation is between question 18 and question 17 ("My familiarity with digital tools makes it easier for me to adopt AI technologies") at -0.07, indicating that students comfortable with adopting AI are slightly less likely to see it as disruptive to critical thinking.

No Significant Correlation (Around 0)

Some pairs of questions show near-zero correlation, indicating no meaningful relationship. Question 20 ("Frequent use of AI tools reduces my motivation to solve problems independently") and question 7 ("AI suggestions improve the quality of my code") have a correlation of 0.00, suggesting that perceptions of AI's impact on code quality are unrelated to concerns about reduced motivation for independent problem-solving. In Conclusion, the PPMC heatmap reveals that students who perceive AI tools as beneficial in one academic area (e.g., understanding concepts, improving code quality) tend to view them positively in other areas (e.g., productivity, engagement), as evidenced by the strong positive correlations among question 1 to question 14. However, concerns about AI's potential to undermine critical thinking, originality, and independent problem-solving (question 18 to question 21) are weakly negatively correlated with these positive perceptions, indicating that students with favorable views of AI are less likely to see it as detrimental, though these concerns are not strongly felt across the sample.

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Ordinal Logistic Regression (OLR)

To assess predictive relationships between students' perceptions and their attitudes toward dependence on AI, an Ordinal Logistic Regression (OLR) analysis was conducted as shown in Table 2.

Table 2: OLR Summary

Sample Size	197 responses
Model AJC	lower is better
Significant Predictors	(p-value < 0.05)

i. Students who rely heavily on AI for support show a higher likelihood of perceiving dependence on AI.

ii. In contrast, those with stronger digital skills and confidence tend to report lower dependency.

While the results of random selecting from the survey questions as shown in Table 4.3 indicates that

i. Higher reliance or benefit from AI = mixed impact: Some benefits (e.g., efficiency, support) increase perceived dependence.

ii. Skills and confidence = reduce perceived dependence.

iii. Concerns about motivation and originality = significantly predict feeling overly dependent on AI.

Table 3 shows the comparison of top 10 survey question and the OLR results. From the OLR results it can be concluded that "Since I started using AI tools, my academic performance has improved.", is the best model fit (lowest AIC), well-predicted by 8 other survey questions, and captures an important outcome (perceived academic impact). Figure 4.3 also buttress our finding from OLR, that the "green bars" indicate statistically significant predictors ($p < 0.05$), "gray bars" are non-significant predictors, and bars to the right (positive coefficients) increase the likelihood of higher agreement with the idea that students become dependent on AI. Table 3 Comparison of Ordinal Logistic Regression Results

Rank	Dependent Variable	AIC	Significant Predictors	Count
1	"Since I started using AI tools, my academic performance has improved."	236.46	8	Best model fit
2	"I find that using AI tools helps me understand complex topics better."	258.51	8	
3	"AI support helps me feel more prepared and confident."	267.16	12	
4	"Using AI applications reduces the time I spend on academic resources."	272.97	7	
5	"The use of AI has improved both my problem-solving and programming skills."	281.57	9	
6	"AI-enhanced learning makes studying more engaging."	282.09	8	
7	"AI provides personalized academic support that is helpful to me."	282.70	6	
8	"My familiarity with digital tools makes it easier to adopt AI."	286.74	6	
9	"Using AI applications reduces the time I spend on academic resources."	290.83	8	
10	"AI suggestions improve the quality of my code (e.g., syntax, logic)."	294.32	7	

The top-ranked model (lowest AIC) revealed that academic performance improvement is highly predicted by other key variables, reinforcing its role as a central learning outcome. From Figure 3: Ordinal Logistic Regression Visualization shows: Green bars = significant predictors ($p < 0.05$); Gray bars = non-significant predictors; Rightward bars = Higher agreement with dependency on AI

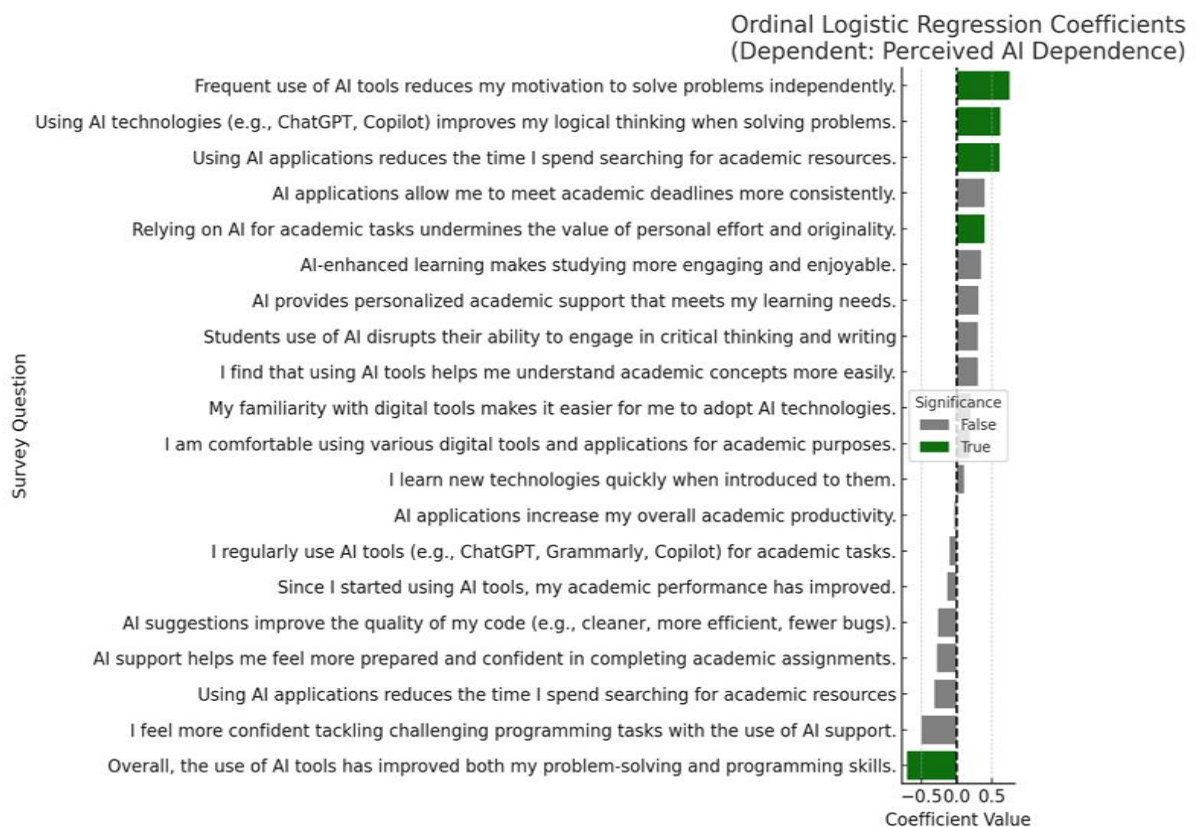


Figure 3: Visual Result of the Ordinal Logistic Regression

Summary of Findings

This study examined the impact of Artificial Intelligence (AI) tools on the academic learning outcomes of Computer Science students at Tai Solarin University of Education, Ijebu Ode. Key findings from descriptive and inferential statistics are as follows:

- Descriptive statistics showed a generally positive perception of AI usage. Students agreed that AI tools enhance their understanding of academic content, improve engagement, and boost productivity.
- Correlation analysis (PPMC) revealed strong positive relationships among various academic benefits of AI tools, such as problem-solving, programming skills, and timely completion of academic tasks. Notably, weak negative correlations existed between students' positive perceptions of AI and their concerns about overdependence.



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- iii. Ordinal Logistic Regression (OLR) highlighted that students who rely heavily on AI tend to perceive themselves as more dependent on it. However, digital confidence and technical skills were associated with reduced perceptions of dependency.
- iv. The question "Since I started using AI tools, my academic performance has improved" emerged as the most predictive of students' perceptions and served as a central variable linking multiple aspects of AI-related academic enhancement.

Conclusion

The analysis concludes that AI technologies play a significant and largely positive role in shaping academic experiences for Computer Science students. The tools are seen as beneficial for understanding complex concepts, improving programming capabilities, and enhancing overall academic productivity. However, while the benefits are clear, there are underlying concerns about overreliance, especially regarding reduced motivation and diminished critical thinking. These concerns, although not strongly correlated with positive perceptions, indicate a need for balanced and guided integration of AI tools into academic environments. The findings also suggest that students with stronger digital skills experience more benefits from AI with fewer negative side effects, reinforcing the importance of digital literacy.

Recommendations

Based on the findings, the following recommendations are proposed:

- i. Integrate AI Literacy into Curriculum: Introduce structured modules that teach students how to effectively and ethically use AI tools in academic contexts. This will help mitigate misuse and build responsible engagement.
- ii. Promote Balanced Use of AI Tools Encourage students to use AI as a supplement not a replacement—for critical thinking, problem-solving, and independent learning. Train Lecturers and Academic Advisors Provide professional development for staff to understand AI tools so they can guide students in their appropriate application for learning and research.
- iii. Monitor and Evaluate AI Tool Usage Institutions should develop systems for monitoring how students interact with AI tools, identifying patterns of overdependence, and providing timely interventions where necessary.
- iv. Foster Digital Skills Development Strengthen digital competence through workshops and courses, ensuring students are not only users of AI but also understand its underlying mechanisms and limitations.

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