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AI-Powered Tool, Learning Styles and Academic Achievement of Pre-Service Biology Teachers

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The study adopted a descriptive survey design to investigate how AI-powered tools influence the learning styles and academic achievement of pre-service biology teachers in southwest Nigeria. The sample consisted of 360 preservice Biology students comprising 145 (40.3%) males and 215(59.7%) females, selected through a purposive sampling method. Data were collected using a structured questionnaire. A pilot test was conducted to establish the reliability of the instrument, and this yielded a high reliability Cronbach's Alpha score of 0.82, showing that the questionnaire produced consistent results. Data collected were analyzed using descriptive statistics, and standard deviations to summarize the participants' responses. The result shows that the preservice Biology students demonstrated a substantial level of both awareness (Mean=3.68) and Utilization of AI powered tools (Mean= 3.52). Also, results indicate that there is a weak correlation between the use of AI powered tools and academic achievement (r=0.118, P=0.085). The result (r=0.127, p=0.072) revealed a weak correlation between AI powered tools and Learning styles. Finally, neither AI powered tools (β = 0.095, p = 0.181) nor learning styles (β = 0.089, p = 0.202) made a unique statistically significant contribution to academic achievement in the study. The study concludes that simply having and using technology is not enough to alter ingrained ways of learning or boosting academic performance. A more deliberate and guided strategy for using AI tools in education is essential. The study thereby recommends the integration of structured AI Pedagogy into the curriculum for pre-service teachers, focusing on the critical and effective use of AI-powered tools for teaching and learning biology.

Keywords: artificial intelligence tool usage, learning styles, academic achievement, pre-service teachers, AI

INTRODUCTION

Education around the world is changing dramatically as Artificial Intelligence (AI) becomes increasingly common. Artificial Intelligence in Education (AIEd) functions as an emerging interdisciplinary field which develops educational systems through AI technology. The educational system now experiences increasing interest in AI applications for science teaching, which coincides with growing research on AI's effects on educational practices. (Chiu et al., 2023; Gonzalez et al., 2017). Recent advancements in generative AI (GenAI) through models like ChatGPT have resulted in unparalleled recognition of AI's ability to transform various sectors industries (Hong et al., 2022: Lucci et al., 2022). The use of AI technology in educational activities reached a new level of advancement after the COVID-19 pandemic forced schools to adopt online and hybrid modes of instruction (Asha'ari et al, 2026). This shift is especially noticeable in universities and colleges, which are now actively testing a new wave of AI tools. These range from smart tutoring systems that offer personalized lessons to advanced programs that can help with research and writing (Rahiman, & Kodikal, 2023). Many are excited about AI's potential to create learning that is more tailored to each

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student, making it more efficient and engaging. Supporters believe these technologies can handle routine tasks for teachers and give students instant help, which could fundamentally change the traditional classroom (Ghamrawi et al., 2024).

However, this fast adoption is not simple. The flood of AI tools into higher education raises important questions about their real impact on learning, beyond just being new and innovative. While many talk about the potential for better learning, there is a growing need for solid research to back up these claims (Selwyn, 2019). Teachers and schools are dealing with real challenges, including issues of academic honesty, the risk of students relying too much on automation, and the need for students to develop a critical understanding of how AI works (Zawacki-Richter et al., 2019). This makes it absolutely essential to investigate what real effect these tools have on things like grades and how students learn.

Advances in artificial intelligence, along with its growing adoption, are opening up significant new possibilities for use in science education, though they also introduce important challenges. Students perceived AI tools as valuable and advantageous for enhancing their learning. They affirm the efficacy of the tools in deepening the knowledge of educational concepts and indicate a desire to continue its engagement in the future (Elkhodr et al., 2023). AI has the potential to reshape how science is taught and learned by supporting more flexible, interactive, and personalized learning experiences (Jiao et al., 2022b, making learning more engaging and enjoyable (Hewapathirana & Almasri,2022). A particularly powerful use of AI in this context is the creation of virtual laboratories and simulated scientific experiments, which allow learners to practice and refine scientific skills in a safe, well-regulated digital environment. Such environments can lower costs and enable exploration of scientific ideas and procedures that might be too expensive, risky, or impractical to implement in conventional school laboratories (Wahyono et al., 2019). Nevertheless, these simulations may not fully reproduce the concrete, hands-on engagement with physical materials and equipment that is vital for some forms of learning, especially where direct manipulation and sensory feedback are central (Tang & Cooper, 2024).

In Nigeria, using technology in education is a key part of the country's development plans. Government initiatives have stressed that digital skills are vital for the nation's progress and its ability to compete globally (Federal Ministry of Education, 2020). The educational sector faces problems like very large classes and limited resources, which makes technology an appealing way to help overcome these hurdles. In theory, digital tools can give students access to huge amounts of information, connect them with learners worldwide, and provide new teaching methods, especially in important subjects like science (Okebukola & Jegede, 2019).

So far, however, the focus has mainly been on basic computer skills and simple technologies. The discussion is only now starting to include more advanced, intelligent systems like AI. For pre-service teachers the future educators of Nigeria it is crucial to understand and navigate this change. Their training colleges are the main place where they can learn about and evaluate these tools safely (Adedoyin & Soykan, 2023). Yet, there is very little local research on how these future teachers are actually using AI and what results they are seeing. This study aims to fill that specific gap by focusing on the southwestern part of Nigeria.

The idea of "learning styles" that students have preferred ways of learning, like through seeing, listening, reading, or doing has long been influential in education, even though it is debated (Othman & Amiruddin, 2010). According to Oyetola and Adetokunbo (2025) Learning style is an individual trait that influences how a student processes and internalizes knowledge into lasting habits. Learners differ in their approaches, with some preferring visual materials or presentations, others benefiting from auditory input such as listening to music, and some achieving better understanding through active, hands-on experiences. In a broader sense, Keefe (1979) described Learning styles as the unique mind-based and emotional-based and body-based characteristics which define how students

perceive and connect with and respond to educational settings. Students demonstrate their learning preferences through the way they observe their surroundings and the way they interact with educational materials and their whole educational process. The discovery of personal learning preferences enables teachers to select the most effective teaching methods which should be used to structure educational activities and learning materials for both classroom and outside learning environments (Özbek, Ö, 2007). Thus, Students' confidence develops through their learning of effective study techniques. The application of suitable learning styles enables students to learn independently from teachers, which allows teachers to take on their role as facilitators. Students take charge of their educational journey, which makes them the main learners who direct their entire learning experience. Furthermore, Numerous studies have examined learning styles and their association with academic performance, highlighting links between specific learning style preferences and achievement across different subjects using a range of measurement scales (Awad, 1999; Rawashdeh et al., 2010; Garcia et al. 2010). Evidence from some investigations indicates a positive relationship between certain learning styles and higher performance in disciplines such as mathematics and physics (Şirin & Güzel, 2006; Adeyemo et al., 2013). Additionally, research exploring learning styles in relation to problem-solving across diverse contexts has identified various correlations, with findings differing according to the learning style measures employed as well as variations in age groups, cultural settings, and environmental conditions (Asha & Al-Absi, 2013; Şirin & Güzel, 2006). Hence, the theory is attractive because if teachers can match their methods to these preferences, learning could be better for everyone. This has led to the hope that the flexible, multi-format nature of AI could be the key to achieving this kind of personalized teaching for all students (Ejjami, 2024).

AI tools seem perfectly suited for this, as they can present information as text, sound, interactive simulations, or visuals. A student who learns best by seeing might get more videos, while a student who learns by doing might get a virtual lab. But the important question is whether these tools actually change how a student learns, or if they just offer temporary, convenient help (Fitria, 2021). Does regularly using a versatile AI tool push a biology student to develop new learning strategies, or does it just make their old habits easier? This study looks at this exact interaction, exploring the link between AI tool use and the learning styles that future biology teachers report.

Focusing on these pre-service biology teachers is a deliberate choice. They are the vital link between new technology and its real-world use in future classrooms. They are both students, who need to use tools to succeed in their own studies, and future teachers, who will soon decide how the next generation learns. How they use AI during their training will likely shape their teaching methods later on (Ertmer & Ottenbreit-Leftwich, 2010). If their experience with AI is positive and effective, they are more likely to use it wisely in their careers. On the other hand, if they lack proper guidance, they might avoid these technologies, which could widen the gap in science education.

Even as AI tools spread and people discuss their benefits, there is a major lack of hard evidence, especially in Nigeria, showing a direct connection between using AI, changes in learning styles, and better grades (Chen et al., 2020). Many studies only look at how often the tools are used or if people like them, without checking the final impact on learning and achievement. This leaves a critical gap in our knowledge: we know the tools are being tried out, but we don't understand their true effect on learning. This study therefore goes beyond just asking if pre-service teachers use AI tools. It tackles the more fundamental question of whether this use is connected to a change in their learning styles and their academic success, providing much-needed evidence to improve both teaching theory and teacher training.

Statement of the Problem

AI-powered tools are becoming increasingly common in Nigerian teacher training programs. However, this is happening without solid research showing how they actually affect learning. A

crucial unanswered question is whether using these tools changes how student-teachers prefer to learn or improves their grades. This lack of knowledge is a problem because it could lead to wasted effort and resources. Without evidence, these future teachers may not learn how to use AI effectively to help their own students. This study was therefore carried out to examine this very issue: the gap between simply using AI tools and seeing a real benefit in learning.

Research Objectives

This study aimed to:

1. Assess the level of awareness and extent of utilization of AI-powered tools for academic activities among pre-service biology teachers.
2. Examine the relationship between the use of AI-powered tools and the learning styles of pre-service biology teachers.
3. Investigate the relationship between the use of AI-powered tools and the academic achievement of pre-service biology teachers.
4. Determine the joint influence of the use of AI-powered tools and learning styles on the academic achievement of pre-service biology teachers.

Research Hypotheses

The following null hypotheses were tested in the study at a 0.05 level of significance:

The following null hypotheses were tested in the study at a 0.05 level of significance:

1. **H_{01}:** The level of awareness and utilization of AI-powered tools for academic activities among pre-service biology teachers is not high.
2. **H_{02}:** There is no significant relationship between the use of AI-powered tools and the learning styles of pre-service biology teachers.
3. **H_{03}:** There is no significant relationship between the use of AI-powered tools and the academic achievement of pre-service biology teachers.
4. **H_{04}:** The use of AI-powered tools and learning styles will not jointly have a significant influence on the academic achievement of pre-service biology teachers.

METHOD

This study used a descriptive survey design to look at how AI-powered tools influence the learning styles and academic achievement of pre-service biology teachers in southwest Nigeria. The population of the study comprised all preservice teachers in Southwest Nigeria. The sample consisted of 360 preservice biology teachers selected through a purposive sampling method. They are purposefully selected because they are the preservice Biology teachers with meaningful exposure to Artificial intelligent tools

Information was gathered using a self-structured 29-item questionnaire. The instrument involves four sections measuring: Section A sought for demographic data. Section B sought to measure the participants' awareness of AI tools; Section C sought to measure how they used them, and section D sought to measure their perceived impact on academic Achievement. The questionnaire items were rated on a four-point likert scale. A Learning Styles Inventory (LSI) adapted from VARK scale which provides a structured means of identifying students' preferred modes of learning was used to measure preservice teachers learning styles. That is, visual, auditory, read/write and kinesthetic

To ensure the questionnaire was accurate and trustworthy, it was checked by experts in science education and technology as well as Test and Measurement. A pilot test was also conducted, which gave a high reliability score (Cronbach's Alpha = 0.82), showing that the questionnaire produced consistent results.

The data collected were then analyzed using descriptive statistics, like averages (means) and standard deviations, to summarize the participants' responses. Correlation analysis was also carried out to

examine the connections between the main factors: AI tool usage, learning styles, and academic achievement.

FINDINGS

Demographic Characteristics of the Participants

This study included a total of 360 pre-service biology teachers from tertiary institutions in southwest Nigeria. The demographic characteristics of the participants are summarized in Table 1.

Table 1
Demographic characteristics of participants (N=360)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	145	40.3
	Female	215	59.7
Academic Level	200 Level	120	33.3
	300 Level	125	34.7
	400 Level	115	31.9

As shown in Table 1, the sample comprised 360 pre-service teachers with a gender distribution of 145 males (40.3%) and 215 females (59.7%). This distribution is representative of the typically higher enrolment of females in teacher training programs in the region. In terms of academic level, the participants were relatively evenly spread across 200, 300, and 400 levels, with 33.3%, 34.7%, and 31.9% representation respectively. This balanced distribution across academic levels helps ensure that the findings reflect the experiences of pre-service teachers at various stages of their training.

Hypothesis 1

H_{01}: The level of awareness and utilization of AI-powered tools for academic activities among pre-service biology teachers is not high.

To test this hypothesis, descriptive statistics (Mean and Standard Deviation) were computed based on the participants' responses to the questionnaire items related to awareness and utilization. The responses were categorised as High, moderate, low and very low. The result of the analysis is presented in Table 2.

Table 2
Descriptive statistics for awareness and utilization of AI-powered tools

Variable	Mean	Standard Deviation	Decision
Overall Awareness	3.68	0.59	High
Overall Utilization	3.52	0.71	High
Composite Score	3.60	0.65	High

Note: N = 360. The mean was interpreted on a 4-point scale where 3.50 – 4.00 = High.

The result in Table 2 shows the analysis of the level of awareness and utilization of AI-powered tools. The composite mean score of 3.60 with a standard deviation of 0.65, indicates that the pre-service biology teachers demonstrated a considerable level of both awareness and use of AI-powered tools for their academic activities. Therefore, the null hypothesis which stated that the level of awareness and utilization is not high is rejected.

Hypothesis 2

H_{02}: There is no significant relationship between the use of AI-powered tools and the learning styles of pre-service biology teachers.

To test this hypothesis, a Pearson Product-Moment Correlation (PPMC) analysis was conducted. The use of AI-powered tools was the predictor variable, and learning styles was the criterion variable. The result of the analysis is presented in Table 3.

Table 3
Correlation analysis of AI-powered tools and learning styles

Variable	Mean	Std. Deviation	r	p-value
AI-Powered Tools	3.45	0.78	0.127	0.072
Learning Styles	3.60	0.65		

Note: N = 360. p > 0.05

The result in Table 3 shows the correlation between the use of AI-powered tools and learning styles. The analysis yielded a correlation coefficient of r = 0.127 and a p-value of 0.072. Since the p-value is greater than the 0.05 level of significance, the correlation is not statistically significant. This indicates that there is only a very weak, positive, and non-significant relationship between the use of AI-powered tools and the learning styles of pre-service biology teachers. Therefore, the null hypothesis is not rejected.

Hypothesis 3

H_{03}: There is no significant relationship between the use of AI-powered tools and the academic achievement of pre-service biology teachers.

To test this hypothesis, a Pearson Product-Moment Correlation (PPMC) analysis was also conducted. The use of AI-powered tools was the predictor variable, and academic achievement (measured by Cumulative Grade Point Average) was the criterion variable. The result is presented in Table 4.

Table 4
Correlation analysis of AI-powered tools and academic achievement

Variable	Mean	Std. Deviation	r	p-value
AI-Powered Tools	3.45	0.78	0.118	0.085
Academic Achievement	3.52	0.54		

Note: N = 360. p > 0.05

The result in Table 4 displays the correlation between the use of AI-powered tools and academic achievement. The analysis produced a correlation coefficient of r = 0.118 with a p-value of 0.085. As the p-value is greater than the 0.05 significance level, the relationship is not statistically significant. This reveals a very weak, positive, and non-significant link between the use of AI-powered tools and the academic achievement of the sampled pre-service biology teachers. Consequently, the null hypothesis (H_{03}) is not rejected.

Hypothesis 4

H_{04}: The use of AI-powered tools and learning styles will not jointly have a significant influence on the academic achievement of pre-service biology teachers.

To test this hypothesis, a multiple regression analysis was conducted. Both the use of AI-powered tools and learning styles were entered simultaneously as predictor variables, with academic achievement as the criterion variable. The result is presented in Table 5.

Table 5
Multiple regression analysis of AI-powered tools and learning styles on academic achievement

Predictor Variable	R	R^2	Adj. R^2	F	df	p-value
Regression Model	0.145	0.021	0.015	3.781	2,357	0.112
AI-Powered Tools (β)				0.095		0.181
Learning Styles (β)				0.089		0.202

Note: N = 360. Dependent Variable: Academic Achievement.

The result of the multiple regression analysis in Table 5 shows that the combination of AI-powered tools and learning styles accounts for only 2.1% of the variance in academic achievement (R^2 = .021). This implies that the predictors have low impact on Academic Achievement. The overall regression

model was not statistically significant ($F(2, 357) = 3.781$, $p = 0.112$). Furthermore, neither AI-powered tools ($\beta = 0.095$, $p = 0.181$) nor learning styles ($\beta = 0.089$, $p = 0.202$) made a unique statistically significant contribution to predicting academic achievement. Therefore, the null hypothesis (H_{04}) is retained. This confirms that, together, the use of AI-powered tools and learning styles do not exert a significant influence on the academic achievement of pre-service biology teachers.

CONCLUSION, DISCUSSION AND SUGGESTIONS

The findings of this study provide critical, evidence-based insights into the complex relationship between AI-powered tools, learning styles, and academic achievement within teacher education in Nigeria.

The finding in Table 2 that pre-service teachers demonstrated high awareness and utilization of AI-powered tools confirms their rapid adoption in the educational landscape (Rahiman, & Kodikal, 2023). The fact that students are highly engaged with these tools is sharply at odds with the results, which show no real connection to improved learning. This strongly suggests that the way students are using AI tools is probably quite basic or limited to routine tasks, rather than being woven into their actual learning methods (Selwyn, 2019). For example, the tools might be used to quickly find facts or correct grammar, actions that do not change a student's fundamental approach to learning or help them understand concepts more deeply (Fitria, 2021). Because of this, the main problem is not whether students can get access to the technology, but rather that they need proper teaching and guidance on how to turn their use of these tools into genuine, meaningful learning (Zawacki-Richter et al., 2019). This finding may be as a result of preservice teachers' engagement of AI tools principally at surface level. students may rely on the tools for mere task completion, shortcut solutions, rather than leveraging on these tools for deep learning process including concept clarification and inquiry- based exploration

The first major finding, which came from Table 3, showed there was no meaningful link between using AI-powered tools and the students' learning styles. This means that even though the pre-service teachers were using these adaptable technologies, their core preferences for how they like to learn such as through seeing, listening, reading, or doing stayed mostly the same. This result questions the common belief that AI tools will automatically support and broaden a person's individual way of learning. It supports the argument that a person's preferred learning style might not be as easy to change as some think, and that technology by itself does not reshape these deep-rooted cognitive habits (Newton, 2015). In practice, this finding indicates that the AI tools were probably treated as general-purpose helpers, not as strategic instruments that were used to actively encourage or change specific ways of learning, which points to a lack of depth in how they are currently being applied (Kuleto et al., 2021).

Furthermore, the analysis shown in Table 4 found no meaningful connection between the use of AI-powered tools and the students' grades. This is a very important result because it goes against the common story that investing in educational technology directly leads to better academic performance. This finding can be understood using the ideas of Selwyn (2019), who states that the actual role of technology in education is often more complicated and has less influence than the optimistic stories we often hear. The lack of a significant relationship shows that simply having access to AI tools and using them was not enough, on its own, to result in higher marks for the students. This could be because the tools are being used for administrative ease or surface-level learning activities rather than for deep, conceptual engagement with biological concepts. It supports the view that without pedagogical integration and guidance, technology risks being a "support crutch" rather than a "learning catalyst" (Fitria, 2021).

Finally, the multiple regression result in Table 5 confirmed that, jointly, AI tool usage and learning styles accounted for a negligible and non-significant portion of the variance in academic achievement

($R^2 = 0.021$, $p > 0.05$). This comprehensive analysis demonstrates that even when combined, these two factors are poor predictors of academic success in this specific context. This reinforces the conclusion that the current paradigm of AI tool adoption among pre-service teachers is disconnected from core learning outcomes. It corroborates the idea that the mere "presence" of technology is insufficient; what matters is the "pedagogical integration" (Zawacki-Richter et al., 2019). The findings suggest that variables beyond the scope of this study such as teaching quality, intrinsic motivation, or prior knowledge may be far more influential determinants of academic achievement than the use of AI tools alone (Crompton et al., 2021). Consequently, the study suggests the urgent need to move beyond promoting access and toward fostering strategic, pedagogically-sound uses of AI that are directly aligned with curriculum goals and assessment practices.

CONCLUSION

This study found that even though pre-service biology teachers in southwest Nigeria are widely aware of and use AI-powered tools, these tools did not significantly change their learning styles or improve their grades. This shows that simply having and using technology is not enough to alter ingrained ways of learning or boost academic performance. The data shows no meaningful link between using AI and doing better in school, meaning that access to these tools, on its own, does not lead to success. Since this was true for all the aspects measured, it highlights a more deliberate and guided strategy for using AI in education is essential. These tools can serve as effective auxiliary aids, and a hybrid approach that integrates human expertise with AI

SUGGESTIONS

Based on the findings of this study, the following suggestions are proposed:

1. The teacher training institutions and the Ministry of Education should integrate structured AI Pedagogy into the curriculum for pre-service teachers, focusing on the critical and effective use of AI-powered tools for teaching and learning biology.
2. School administrators and heads of departments should prioritize and fund intensive training workshops and seminars for both lecturers and pre-service teachers on how to ethically and strategically leverage AI tools to achieve specific learning objectives.
3. Tertiary institutions should strengthen their academic support units to provide ongoing guidance and resources for students and staff on the evolving landscape of educational AI, ensuring its use is aligned with academic integrity and pedagogical best practices.

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