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AI Reliance as Predictors of Study Habits, and Problem-Solving Skills of Science Education Undergraduates: A Case study of Imo State University Students

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Abstract
This study determined how reliance on AI predicts study habits, and problem-solving skills of science education undergraduates in Imo State University. The study adopted a survey and predictive correlation research design. The study's population comprised 321 science education undergraduate students. The researcher utilized census sampling i.e. using the entire population as the study's sample. For data collection, a researcher-made rating scale titled "AI reliance, Study Habits and Problem-solving skills of science education Undergraduates" was employed. Cronbach alpha statistics was used to ascertain the instrument's reliability which yielded a coefficient of 0.81. The research questions were answered using descriptive statistics (mean and standard deviation) while the null hypotheses were tested using simple linear regression statistics at 0.05 level of significance. The findings showed that there is an above average level of reliance on AI tools among undergraduates of science education (mean = 2.51); majority of the science education undergraduates under study have good study habits (mean = 3.31); undergraduates' reliance on AI tools did not significantly predict their study habits (Beta =, p = 0.110); majority of the science education undergraduates under study have good problem-solving skills (mean =3.21) and their reliance on AI tools significantly predicted their problem-solving strategies (Beta = 0.468, p = 0.002). The researcher recommends that lecturers should clearly teach their students to distinguish between the tasks which need AI assistance and those which require their independent input.

Keywords: *Artificial Intelligence (AI), Science Education, Undergraduate students*

Introduction

Artificial intelligence tools have rapidly spread through the 21st century and this spread is currently changing and restructuring how undergraduate students seek information, study, and solve problems. The use of AI tools among students especially in the science related disciplines, supports a variety of academic tasks such as explanation of concepts, research, analysis and even problem solving (Almasri, 2024). This evident change has obviously led to important questions being asked as to how far students are to rely on AI and its implication for lifelong learning and cognitive development in the long run (Hassen, 2025).

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A cursory observation at the daily routines of undergraduate students in various tertiary institutions, will reveal a strong attachment otherwise, growing reliance on AI. Students clearly use these tools many times in a day for explanation of concepts, writing assignments and designing workflows to meet deadlines (Fošner, 2024). Studies by Labadze et al (2023) and Ward et al (2024) have revealed that students perceive AI to be integral to their routine study strategies and processes. AI tools are no doubt seen as assets given the efficiency, ease of personalization and prompt support it provides to users.

AI shapes students' study habits in various ways, such as giving summaries and paraphrasing; concept clarification (Lyu et al, 2024); and assignment drafting. These lead to shorter study times, less textbook use, heavier task outsourcing and faster completion of assignment (Olanrewanju et al, 2025). Proper use of AI can improve students' critical thinking and problem-solving skills (Rashed et al., 2026). At the same time high reliance on AI has been linked to reduced critical thinking and problem-solving ability and sometimes, high cases of academic laziness (Zhai et al, 2024; Çela et al., 2024).

Weakness in independent reasoning has been linked to over-reliance on AI (Hou et al., 2025). It is essential to strike a balance in the use of AI tools so as to ensure that AI serves as an augmentation to students' knowledge and not complete cognitive atrophy (Hassen, 2025). This balance will also inform policies on academic integrity and ethical use of AI. Students in science related majors are among the major users of AI for academic purposes (Buniel et al., 2025; El-Fathi et al., 2025). The study of over-reliance on AI is very relevant to science education majors who are future teachers because they must teach students to balance use and avoid over-reliance of AI in their academic endeavors (Almasri, 2024). Also, these teachers have the responsibility of designing AI-enhanced learning environments that preserve the creativity and inquiry nature of science courses (Lin & Chen, 2024).

AI tools have become a central piece in the approaches university students use to study and solve problems especially in science-related fields. There are recorded benefits of AI use such as efficiency and engagement in higher-order thinking. However, when reliance on AI becomes highly excessive, it poses risks to the academic life of students. The excessive use of AI by undergraduates has recently come under some level of scrutiny. Some studies have shown that over reliance on AI can impact the study habit of students negatively in that students' ability to think critically is reduced when they outsource most of their assignments and classwork to AI. Furthermore, there is a growing concern on students' ability to solve problems independently since they automatically receive help from AI. While many authors have raised the aforementioned concerns, there is a dearth of evidence on the extent to which reliance in AI reliance predicts the study habits and problem-solving skills of students, especially among undergraduate science education students in the southeastern part of Nigeria, who will eventually become key players in moulding the future of the next generation of science experts (students). It is therefore on this premise, that the researcher bases the relevance of studying AI reliance as a predictor of study habits and problem-solving. The findings would fill this gap in knowledge and give insights as to how science education undergraduates can use AI for improved academic outcomes.

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Objectives of the study

The study specifically set out to determine:

i. the extent of reliance in AI tools among undergraduates in science education
ii. science education undergraduates' current study habits
iii. science education undergraduates' current problem-solving strategies
iv. if reliance on AI tools predicts the quality of undergraduate students' study habits.
v. if reliance on AI tools predicts undergraduate students' problem-solving strategies

Research Questions

1. To what extent do science education undergraduates rely on AI tools?
2. What are the current study habits of science education undergraduates?
3. What are the current problem-solving strategies of science education undergraduates?

Hypotheses

Ho1: Reliance on AI tools does not significantly predict the quality of undergraduate students' study habits.

Ho2: Reliance on AI tools does not significantly predict undergraduate students' problem-solving strategies.

Literature review

The field of artificial intelligence has advanced very rapidly and has penetrated almost every aspect of human life. Academia is certainly not an exception. AI has since its inception, constantly played unique roles in academia. Studies have shown that AI influences the learning process of students which has led to raised concerns about learners' critical thinking (Abuzar et al., 2025).

Recently, there is a thrilling experience of a unique impact of AI tools usage on students' educational processes and even their achievement. These impacts bring about changes which are noticed in students' overall development i.e cognitive, affective and personal/interpersonal aspects. As a result of these experiences, students at various levels strive to improve their AI literacy levels to gain and maintain a competitive edge in the digital world (Bećirović et al., 2025).

Artificial intelligence has been used increasingly by students to help gain clarity on concepts presented in the classrooms or during their private study. It also offers a wide variety of learning experiences for students, putting into consideration the distinct learning styles of the students as are presented in students' AI prompts. AI use is not only beneficial to students but educators have also come to benefit from it in terms of planning their instruction and automating tasks such as grading and reviewing of papers (Labadze et al., 2023).

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Undergraduates use AI in different ways which may be beneficial to their learning or just for the purpose of completing assignments with little or no contribution on their part. One significant use of AI in academics is the use of Conversational Tutoring Systems (CTSs), which is characterized by providing learning experiences which are dialog-based and specifically tailored to the individual need of the students (Black & Tomlinson, 2025). A good example of the CTSs is the use of generative AI such as ChatGPT, Gemini, Perplexity AI etc where these systems assume the role of tutors and engage students in organized discussions for the purpose of answering questions, giving clarity to students on the concepts they present and guiding them through problem solving.

Previous studies have shown the use of AI to be beneficial in improving students' academic outcomes and motivation. For example, El-Fathi et al., (2025) investigated the effectiveness of using ChatGPT as a supplemental pedagogical tool for engineering undergraduates and recorded that students who were taught using structured chatGPT conversations and prompts outperformed students who were taught traditionally with great improvement observed in their conceptual understanding.

In the same vein, a study by Labadze et al (2023) revealed that students primarily gained from AI-driven chatbots in three major areas viz: assistance in homework and personal study, a personalized learning experience, and the development of various skills. They also revealed a major advantage for educators which is improved instruction.

Conversely, a study by Kaabi, (2025) revealed adverse effects of AI use on the critical thinking and academic outcomes of undergraduates in a higher technical college with 94.5% of the sampled students reporting detrimental effects on critical thinking and linguistic skills. Furthermore, overreliance on AI has been linked with post-task trust and over satisfaction with AI chatbots while appropriate reliance on AI tools has been linked to self-efficacy in programming skills and balanced need for cognition among higher education students (Pitts et al., 2025).

This study is anchored on two theories viz: the Technology Acceptance Model (TAM) by Davis (1989) and the Cognitive Offloading / Extended Mind Theory (Clark & Chalmers, 1998). The technology acceptance model propounded by Davis in 1989 suggests that there are two major factors which determine an individual's adoption of a specific type of technology. These factors are: Perceived usefulness and perceived ease of use. In other words, when a specific type of technology is seen as useful and quite easy to use, individuals are naturally prone to make use of such technology. This theory is directly related to the current study as it explains why science education undergraduates rely on AI. When students view AI as being a useful tool in their academic endeavor and also the ease with which AI tools are readily accessible on phones and various gadgets, they are more likely to rely on these AI tools which may directly or indirectly shape the way students approach their class problems.

The Cognitive Offloading / Extended Mind Theory was propounded by Clark and Chalmers (1998) and this theory largely argues that the human mind has a way of delegating cognitive tasks to available physical or digital tools. This theory plays a central role in this study as it provides the basis for analysing whether relying on AI leads students to offloading their critical thinking

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and problem-solving abilities (implying atrophy) or enhancing their problem-solving capacity by freeing up cognitive capacity for higher order synthesis.

These theories, together with the reviewed studies, give a clear view as to how and why AI is being used by undergraduate students in various institutions and provides a premise to check whether this reliance predicts the study habits and problem-solving skills of undergraduate science students.

Methods

The study was carried out using a survey and predictive correlation (predictive analysis) design. The study was carried out in Imo State University Owerri. The population of the study is made up of all the science education students (Education Biology, Education Physics, Education Chemistry, Education Mathematics and Education Agric Science) in the 2024/2025 academic session comprising 321 students (100 level to 400 level). The researcher utilized census sampling technique given that the population was not excessive, as such, the entire population was used as the sample size. The instrument for data collection is researcher-made rating scale divided into 3 different sections to elicit information on students' extent of reliance on AI tools; study habits; and problem-solving approaches. The rating scale was designed in a 4-point Likert format of strongly agree (4 points), agree (3 points), disagree (2 points), and strongly disagree (1 point). The instrument was validated by 3 specialists (one in educational measurement and evaluation and two in science education). The instrument's reliability was determined using Cronbach alpha statistics which yielded a joint coefficient of 0.81 for the three sections. The rating scale was distributed to the students using carefully created google forms which required answers for every item to avoid missing data. Responses were received from 268 students giving a response rate of 83.5%. The research questions were answered using mean and standard deviation while the hypotheses were tested using simple linear regression statistics at 0.05 level of significance.

Results and discussion

Table 1: Extent of Reliance on AI tools among science education undergraduates

S/N	Items	Mean	Std. Deviation	Remarks
1	I find it difficult to start a science assignment without first consulting an AI tool for ideas	2.62	.921	High
2	I rely on AI to explain complex scientific concepts rather than searching through my textbooks	2.62	.973	High
3	I use AI tools to generate the step-by-step procedures for my laboratory reports	2.38	.590	Low
4	I cross-check my personal solutions to science problems with AI to ensure they are correct	2.90	.768	High

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5	A significant portion of my study time is spent interacting with AI chatbots	2.62	.805	High
6	I prefer using AI-generated summaries of research articles over reading the full original papers for writing my assignments.	2.67	.796	High
7	I feel less confident in my academic work if I do not have access to AI tools	1.90	.625	Low
8	I often submit AI-generated suggestions as my primary answer for my assignments	2.33	.856	Low
	Mean of item means	**2.51**		

Table 1 shows the undergraduates' mean responses on their extent of reliance on AI tools.

The responses are rated in a four-point Likert scale format, giving a criterion mean score of 2.50. From the table, it is seen that items 3, 7, and 8 have their mean responses below 2.50, indicating that majority of the respondents do not: use AI to generate step-by-step procedures for their laboratory reports; feel less confident if they have no access to AI tools, and submit AI-generated suggestions as primary answers to their assignments. On the other hand, the rest of the items have their mean scores above 2.50 showing agreement with the corresponding statements. The mean of item means is 2.51 which is slightly above the criterion mean of 2.50. This clearly implies that there is an above average level of reliance on AI tools among undergraduates of science education in the studied University with students particularly struggling to start assignments without consulting AI and preferring AI-generated summaries over original texts. Notably, the students demonstrated lower agreement with submission of AI-generated suggestions as primary answers and feeling less confident without AI access, and this suggests that they are quite aware of academic integrity boundaries in the use of AI. This finding of above-average AI reliance (mean = 2.51) among science education undergraduates is in consonance with the swift progression of regularization of generative AI use among students in higher education. Current studies have shown that a huge population of undergraduate students use generative AI in some form. Previous findings from Ward et al. (2024) reported a sort of balanced integration of AI tools in students' study time. They further reported that 56% of students use AI tools for 26-50% of their study time, maintaining a mix of traditional and AI-assisted methods.

This finding further revealed that students are reluctant to use AI for generating step-by-step laboratory report; rarely submit AI-generated suggestions as primary answers, and do not feel less confident without AI access and this suggests strategic AI use rather than over-reliance. This finding is in contradiction with previous findings by Zhai et al. (2025) who raised concerns about cognitive offloading as a result of overdependence on AI. In their study, they recorded that heavy AI reliance was seen to diminish decision-making and critical analysis abilities of individuals. This difference in findings may be explained by environmental context in that Ododo et al. (2024) reported that vocational education students in Akwa Ibom State, Nigeria, showed significant concerns about AI reducing cognitive engagement through passive acceptance of information.

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The fact that the students maintained confidence without AI access particularly contrasts with Habib et al. (2024), who found that over-reliance on AI suggestions led to "lower creative confidence" among undergraduate students in creative thinking courses. This finding therefore means that science education undergraduates in Imo state university may possess stronger AI literacy and the required instructional scaffolding that promotes critical engagement rather than passive consumption of information from AI. This further implies that a combination of high AI literacy and organized instructional design/strategies may produce positive outcomes in terms of problem-solving.

Table 2: Study Habits of science education undergraduates

S/N	Items	Mean	Std. Deviation	Remarks
1	I have a specific daily schedule or timetable dedicated to studying my science courses	3.10	.889	Good
2	I take comprehensive notes in my own words during lectures and private study sessions	3.71	.463	Good
3	I review my previous lessons consistently, even when an examination is not close	3.24	.625	Good
4	I can maintain focus on my schoolwork for long periods without getting distracted by my phone	2.90	.889	Good
5	I utilize digital databases to find extra reading materials	2.95	.973	Good
6	I set specific learning goals for myself at the beginning of every study session	3.48	.512	Good
7	I engage in group discussions with my peers to better understand difficult science topics	3.48	.680	Good
8	I practice self-testing or active recall to ensure I remember what I have studied	3.57	.507	Good
9	I create summaries or concept maps to organize the information I learn in class	3.43	.598	Good
	Mean of item means	**3.31**		

Table 2 shows the mean scores on the self-rating of the undergraduates on their study habits. The mean responses on all the items are above the criterion mean of 2.50. This indicates that the majority of the students are in agreement with the corresponding statements, indicating a good self-rating of healthy study habits. The mean of item means is 3.31 which is also greater than 2.50 and implies that majority of the undergraduates under study have good study habits. This finding shows that despite the above average reliance in AI tools reported in the previous findings, the students have remarkedly good study habits from their responses. The high mean score for study habits (3.31) indicates that students maintain healthy study practices despite AI integration. This finding is in tandem with that of Ward et al. (2024), who reported in a similar

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study that students reported enhanced efficiency as a result of using AI tools while cautioning against over reliance on the tools. The Student Perceptions of AI 2025 survey reported by the National centre for AI study (2025) similarly noted that there was a reevaluation of approach to study by students who initially used AI as their major resource and experienced a decline in their work. Consequently, better study habits were picked after reevaluation of mode of AI use.

Corresponding hypothesis

Table 3: Summary of simple regression statistics showing how reliance on AI tools predicts study habits

Model Summary						
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**	**F**	**p-value**
1	.359[a]	.129	.083	4.009	2.808	.110

a. Predictors: (Constant), Reliance score

Table 3 shows how reliance on AI tools predict study habits of undergraduate science education students. Generally, the model summary gives a relationship coefficient of 0.359 which is a low and positive relationship. The coefficient of determination (R square) is 0.129 which implies that only 12.9% of the students' study habits can be accounted for by their reliance on AI tools. Consequently, a p-value of 0.110 was gotten, which is not statistically significant and this implies that undergraduates' reliance on AI tools did not significantly predict their study habits.

This finding partially contradicts Zhai et al. (2025), who in a similar study, recorded that the problem-solving skills and cognitive engagement of students greatly decreased with over-reliance on AI tools for academic tasks. Science education students as a result, may sustain healthier study habits due to their use of AI as complementary tool and not a replacement for the actual learning process.

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Table 4: Problem-solving strategies of science education undergraduates

S/N	Items	Mean	Std. Deviation	Remarks
1	I break down complex science problems into smaller, manageable parts before attempting them	3.05	.669	Good
2	I can explain the underlying logic behind the steps I take to solve a problem or assignment	3.19	.602	Good
3	I actively look for connections between new science problems or concepts and concepts I have learned previously	3.05	.669	Good
4	When faced with a confusing result in laboratory practicals, I systematically review my process to find the error	3.43	.507	Good
5	I prefer to work out the solution to a problem myself before looking for the answer elsewhere	3.43	.746	Good
6	I use diagrams or mental models to visualize concepts when I try to answer exam or test questions or when solving assignment problems	3.24	.700	Good
7	I evaluate the "reasonableness" of my final answer to ensure it makes sense	3.43	.507	Good
8	I enjoy the challenge of solving problems that do not have a straightforward answer	2.86	.964	Good
	Mean of item means	**3.21**		

Table 4 shows the mean scores on the self-rating of the undergraduates on their problem- solving strategies. The mean responses on all the items are above the criterion mean of 2.50. This indicates that the majority of the students are in agreement with the corresponding statements. This invariably implies that the undergraduates rate their problem-solving skills as good. The mean of item means is 3.21 which is also greater than 2.50 and implies that majority of the undergraduates under study have good problem-solving skills.

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Corresponding hypothesis

Table 5: Summary of simple regression statistics showing how reliance on AI tools predicts problem solving strategies

Model Summary						
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**	**F**	**p-value**
1	.645[a]	.416	.385	2.370	13.523	.002

a. Predictors: (Constant), Reliance score

Table 5 shows how reliance on AI tools predict problem solving strategies of undergraduate science education student. The model summary shows a moderate and positive relationship which in 0.645, implying that there is a strong relationship between students' reliance on AI tools and their problem-solving strategies. The coefficient of determination (R square) is 0.416 which implies that 41.6% of the students' problem-solving strategies can be accounted for by their reliance on AI tools. The corresponding p-value is 0.002 which is less than 0.05 (statistically significant), leading to the rejection of the null hypothesis. This invariably means that undergraduate students' reliance on AI tools significantly predicts students' problem-solving strategies.

This is perhaps the most outstanding finding of the study. This moderate-to-strong positive relationship suggests that students who rely more on AI tools report better problem-solving strategies. This finding aligns with a systematic review of 158 studies (2021-2024) which revealed that 94% of the studied works reported substantial advances in cognitive skills of AI users including problem-solving as a result of the personalized learning and feedback nature of most AI tools (Freeman, 2025).

However, this positive correlation contradicts a considerable number of previous literatures which raised concerns on the risk of cognitive offloading enhanced by AI use. For example, Kosar et al. (2024) and Krupp et al. (2024) found that students' reliance on AI for immediate solutions increased their likelihood of exempting themselves from vital and deep cognitive processes on which effective learning is built. Similarly, Correia et al. (2024) showed that over-reliance on AI-based answers reduces students' critical thinking and metacognitive reasoning. The positive relationship in this study may reflect self-perception bias i.e. students may rate their problem-solving strategies based on AI-assisted outcomes rather than independent capability. Giving credence to self-perception bias, Jose et al. (2025) identified in their study that AI can assume amplify cognition while also inhibiting it.

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Implications and recommendations

The study's finding poses significant implications for educational practice. The results showed a sort of limitation in AI dependence among the undergraduates and this for lecturers/educators, imply that undergraduate students can actually be guided on how to use AI in a beneficial way. Lecturers should clearly teach their students to distinguish between the tasks which need AI assistance and those which require their independent input.

The finding that reliance on AI tools positively predicts problem solving strategies suggests that curriculum can be designed in a way that integrates AI tools into problem-based learning and at the same time, limiting the use of AI for assessment so as to check progress of students in the use of their independent abilities.

The study showed that AI reliance did not predict study habits. This clearly implies that maintenance of good study practices for the science education undergraduates goes beyond AI use but mediations such as introduction of study skills workshop for undergraduates, training in time management and provision of motivational support by lecturers would go a long way in influencing their study habits.

Conclusion

This study showed that undergraduates science education students rely on AI but in a strategic manner, playing cautionary roles in the use of AI for high-risk tasks. From the study, it was seen that AI reliance did not significantly predict study habits, but predicted problem-solving strategies. This is to say that, the science education students have carefully learned how to use AI tools as a support for their study and not entirely rely on AI for their studies. This largely indicates that exploration of various AI tools and how to ethically use them can be encourages among science education undergraduates. These findings align with a balanced approach to AI use where students use AI tools as a cognitive enabler rather than substitute for their intellect. Future research may examine the longitudinal effects of AI use on science education undergraduates' cognition. Also, a further look into how the study habits and problem-solving skills of undergraduates in other education non-science subjects are influenced by their reliance on AI tools would go a long way in providing generalization of the present study's findings across education.

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