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Artificial Intelligence (AI) Powered Tools Usage: Constraint on Students' Creativity and Problem-Solving Skills in Universities and Colleges of Education in Delta State, Nigeria

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Abstract

The study assessed the effect of Artificial intelligence powered tools usage on the creativity and problem solving skills of students in universities and colleges of education in Delta State, Nigeria. It was guided by two research questions. The ex- post facto research design was used. The population was all the universities and colleges of education students in Delta State during the 2024/2025 academic session. A sample of 1,000 students was drawn for the study through the stratified random sampling technique. The collection of data was with the use of a questionnaire titled: "Artificial Intelligence Usage in Higher Education Institutions Questionnaire" (AIUHEIQ). Three experts validated the questionnaire. It reliability was confirmed with the test-re-test method which gave a Cronbach coefficient value of 0.75. The percentages, mean scores and standard deviations were used to analyze the data at a decision criterion of 2.50. The findings revealed that AI-powered tools usage in universities and colleges of education do not limit students' creativity and problem solving abilities. Instead, these tools enhance academic productivity, support generation of ideas, and improve students' writing quality. Thus it was recommended among others that the government, academia, the private sector and the communities should form multi-stakeholder partnerships aimed to design, fund and run AI initiatives, in the educational institutions.

Keywords: Artificial intelligence, Constraint, Creativity, Problem-solving skills, Universities, Colleges of Education

Introduction

The emergence of Artificial Intelligence (AI) in education has significantly advanced digital instructional methods globally by providing increasingly human-like teaching and learning resources. This technological, transformative and innovative change has occurred in many fields of which education is inclusive. According to the view of Russell and Norvig (2020), AI is a computer-based system which undertakes tasks requiring human intelligence, such as knowledge acquisition, problem-solving, and language comprehension. Its use in the field of education has brought about transformation that has reshapes the mode of how teachers deliver lessons, assessment, students and support students' academic progress.

Universities and colleges of education are higher education institutions in Nigeria whose main mandate is to produce high and mid level skilled manpower for the nation. These citadels of learning have adopted AI for teaching and learning aimed to improve instructional outcomes. This has significantly changes the way these higher education institutions teach by using tools such as tutoring systems, predictive analytics, adaptive learning and content creation tools. AI has also helps higher education institutions manage tasks. The Research by Holmes, Bialik and Fadel (2022) and Zawacki-Richter, Marín, Bond and Gouverneur (2019) demonstrated that AI provides instructional and administrative structures in universities and colleges. These frameworks lower the administrative load and personalize the instruction by using AI tools such, as ChatGPT, Grammarly Wolfram Alpha and Jasper AI. These tools improve learning outcomes, foster rational thinking and promote experimentation. Li and Deng (2024), observed that the platforms support comprehension, deepen the problem solving skills, enhance the learning environment and encourage the creation of content. Consequently, AI technologies offers a way to innovation and transformative tertiary education in Nigeria, particularly in fixing the multiple problems of under-funding, student population explosion, and ease the challenges of faculty shortages.

Creativity and problem-solving skills are higher level thinking abilities which are relevant to the goals of higher education. Here, creativity refers to the ability to generate original, innovative, and valuable content or solutions, while problem-solving skills mean the capacity to recognize complex issues and systematically develop effective strategies to resolve them (Runco and Acar, 2012). The integration of AI – technologies to perform tasks that that resembles human mind in universities and colleges of education is inhibited by good fortunes for fostering students' creativity and problem-solving abilities. According to Luckin, Holmes, Griffiths, and Forcier (2016), when AI is appropriately implemented, it can enhance creative and problem-solving skills by providing learners with new perspectives, improving feedback, and offering opportunities to explore ideas beyond traditional instructional limitations.

Students are rapidly engage in the use of AI tools for tasks that could demand active cognitive effort, such as brainstorming, essay writing, analytical reasoning, and design thinking. Excessive reliance on these tools may result in intellectual dependency, reduced cognitive engagement, and passive learning. Bender, Gebru, McMillan-Major, and Shmitchell (2021) and Holmes et al. (2022) caution that over reliance on AI tools can discourage learners from engaging in the intellectual processes necessary for developing original ideas. Consequently, the students may find it hard to solve problems in a creative manner, in the higher education setting where independent thinking is expected

Within the universities and colleges of education in Delta State which are the focus of this study, AI is used in various ways which has helped to improve students digital literacy. Students from affluent families often get early exposure to digital technology, including artificial intelligence platforms. Early exposure gives the students from these families a strategic advantage in building academic skills. Conversely, many students, from less wealthy families have only just started using

AI tools. In most cases, these students lack the necessary skills to use such technologies effectively in their academic pursuits (Okoye and Awotunde, 2023).

This digital divide can affect students' grades and the growth of students creative and problem solving skills. Some students reportedly use the tools to save time and to improve upon the quality of their work. Other students use the tools as substitutes for independent thinking and intellectual effort. Consequently, AI has changed the conceptualization and delivery of the teaching, learning, assessment and academic support. Students can become dependent on AI-generated solutions which can hurt the growth of strength that students need for independent problem solving (Zhou et al. 2020). Bali (2023) cautioned that much reliance on AI that creates content can lower students ability to think independently and creatively. Similarly, Bender et al. (2021) warn against uncritical acceptance of machine-generated content, particularly from large language models (LLMs), as these may produce plausible but inaccurate or biased information.

Although many studies have investigated AI use in universities, schools, and colleges in Nigeria and internationally, but only a few have examined the effect of AI on undergraduates' creative and problem-solving abilities in universities and colleges of education, particularly in Delta State. This gap in the literature, forms the basis for the present study. These issues have generated ongoing debates regarding the ethical, pedagogical, and cognitive implications of AI in educational contexts. Accordingly, this study investigates the constraints imposed by artificial intelligence-powered tools usage on students' creativity and problem-solving skills in universities and colleges of education in Delta State, Nigeria.

Rational of Study

AI integration is causing a shift, in the educational institutions of higher learning. It emergence has made the universities and the colleges of education to use the learning platforms and the intelligent tutoring systems. These adaptive learning platforms give each student a learning path that fits the student's needs and the student's style. The intelligent tutoring systems for example give each student instruction and a different learning experience which helps the teachers and the leaders make decisions based on data. This has reshaped the way teaching and learning is being conducted in Nigeria. Both students of universities and colleges of education institutional environment are adopting AI-powered tools for improving their potentials which has significantly enhanced their productivity, accelerate individual learning outcomes, and support various academic tasks such as drafting of assignments, writing of term papers, and generating of research ideas, coding, paraphrasing, preparing presentations and many more.

Some scholars warn against use of AI technological tools because it may make the students learn passively. They claim that reliance on AI tools hurts independent and creative thinking of the students. Holmes et al. (2022) Zhou et al. (2020) and Bali (2023) argue that excessive reliance, on AI tools weakens independent and creative thinking skills of the students and creates passive learning habits. All of this is a worry that has started a debate about the teaching and thinking effects of AI usage by students, in universities and colleges of education where the changes happen fast. Thus, AI usage can slow down thinking and problem solving skills of students. The study

therefore, examines how the AI-powered tools used by students hurt student's creativity and problem-solving skills in universities and colleges where independent thinking matters.

Objectives

The study's major aim was to assess the constraints that the use of AI tools creates to students' creativity and problem solving skils in universities and colleges of education, in Delta State, Nigeria where students use AI tools. Specifically, the study would also:

1. Identify the ways the use of AI-powered tools limit the creativity and problem solving skills of students in the universities and colleges of education, in the Delta State of Nigeria.
2. Determine the responsible and productive strategies for AI-powered tools usage by students in universities and colleges of education in Delta State, Nigeria.

Research Questions

1. What are the ways the use of AI-powered tools limit the creativity and problem-solving skills of students in universities and colleges of education, in Delta State, Nigeria?
2. What responsible and productive strategies can be adopted on AI-powered tools use by students at the universities and colleges of education, in Delta State, Nigeria?

Literature Review

Theoretical framework

This study was hinged on the Self-Determination Motivation theory which was introduced by Deci and Ryan in 1985. The theory says there are three psychological needs: autonomy, competence and relatedness. And that optimal learning and personal growth depend on those needs being met. The theory describe autonomy as the individual's ability to make and manage choices and learning in a given environment. Competence refers to the sense of effectiveness in mastering tasks. Relatedness describes the feeling of connection and belonging with others during meaningful social engagement.

Building on this framework, meeting these psychological needs enables learners to develop intrinsic motivation, engage more deeply, and achieve improved learning outcomes when utilizing AI-powered tools. However, too much reliance on the AI-powered tools for academic support can weaken the intrinsic motivation and lower the students confidence in addressing academic challenges that demands creativity, problem-solving, and perseverance. It is on this note, Tegmark (2018) warned against overuse of AI tools in higher education institutions citing can it can slowly wear down the learners motivation and self-efficacy, in creative and problem-solving skills.

Artificial Intelligence (AI) Technologies

AI consists of a set of computer made tools designed to improve human capabilities in in learning, thinking and solving problems. According to Russell and Norvig (2020), AI involves creating intelligent agents that can act in the surroundings by interpreting and responding commands to

meet set goals. It is incorporated into adaptive learning platforms, the coaching systems, the plagiarism detection tools, the automated grading systems and the applications such as ChatGPT, Grammarly, QuillBot, Bing Copilot and Google's Gemini.

The AI tools support the students in writing, grammar, summarizing, mathematics and coding. Holmes et al. (2022) opined that the tools are important to contemporary education, marking a transition from traditional methods to more student-centered approaches. These tools help learning and track student progress which accord the right assistance. The tools let educators manage classes better and improves educational outcomes.

AI Usage for Students' Creativity and Problem-Solving Skills

Creativity is a major quality virtue for students involvement in many school tasks. The tasks include writing papers making research questions designing experiments and presenting arguments in colleges and universities. Runco and Jaeger (2012), defined creativity as the skills and potentials to produce work that's fresh and original. Creativity in colleges and universities is aimed to stimulate thinking, new ideas and the ability to make new solutions to prevailing school and real world problems. These capacities are not only required in the classroom or academic setting but as well vital for building, development and leadership sector of the larger community, society or nation. The move, to adult life needs the skills to handle work places to do duties and to add real value to the nation's growth.

Sternberg (2018), stressed that educational institutions do not only need to focus on the academic knowledge but should also produce graduates with imaginative skills who are ready to tackle social issues and problems. For instance ChatGPT as an AI tool helps students in various ways such as to brainstorm, to generate outlines, an aid in rephrasing texts, and explore perspectives on a subject (Clark et al. 2023). The features of ChatGPT act, as thinking support which refine students' thoughts and help deepen students' knowledge.

The Role of AI in Fostering Student Problem-Solving Skills

Jonassen (2014), asserted that problem-solving needs a person to spot a problem and then look at it step by step. The step by step process checks target solutions and then picks the best solution. This problem-solving skill is used in many disciplines such as the sciences, engineering, humanities and education. Higher education curricula often incorporate problem-solving tasks which can be case studies, laboratory experiments, project based learning and analytical writing assignments. This activity help a student to think critically, reason logically and enables students to apply or use what they know in practical situations.

Artificial intelligence technologies help solve problems. These technologies provide coaching systems that give the step by step guidance and the personal hints which enables the students tackle the problems. The platforms such as WolframAlpha and Mathway give the answers for the mathematical questions. The coding assistants such, as GitHub Copilot help the students debug and improve the programming tasks. In the view of Holmes et al. (2022), AI-powered tools

influence problem-solving efficiency by reducing cognitive load and offering just-in-time feedback. But its inappropriate usage, can lead to dependency and superficial learning.

Strategies for the Implementation of AI in Higher Education

Uloma and Mfonobong (2024) propose several strategies for effective incorporation of AI into Nigerian universities and college. These include embedding AI within national education policy through the National Artificial Intelligence Strategy (NAIS), supported by dedicated roadmaps for ethical integration. The authors recommended establishing governance structures which should include the AI ethics expert group. In their view, the governance structures should also use the assessment tools, for the AI projects and should follow the Nigeria Data Protection Act.

Furthermore, stress that public-private partnerships are important. The public-private partnerships should expand the broadband access and should develop the solar-powered technology hubs and deploy the low-bandwidth AI tools to reduce the divides.

Extra strategies identified by Sternberg (2018) and Bali (2023) include adding AI literacy, ethics and critical thinking to the school curricula from the level onward. The strategic method should involve integrating robotics. The strategic method should also develop content in local languages Also educators need professional development in AI teaching, digital literacy and ethical guidance. Continuous professional development should place teachers as guides, for instruction not as replacements. The development of culturally relevant AI tools that leverage diverse datasets reflecting Nigeria's linguistic and social diversity is necessary to ensure inclusivity for marginalized groups.Multi-stakeholder partnerships involving government, academia, the private sector, and communities are recommended for collaborative design and funding mechanisms.

Significance of the Study

This study holds considerable significance at multiple levels - academic, institutional, technological, and policy-related especially in light of the rapid digital transformation occurring in Nigerian universities and colleges of education which ultimately, supports the vision of building smarter and more resilient higher education that are equipped to thrive in the digital age. It bears significant implications for students, who are the primary users of digital learning platforms by advocating for AI-enhancement which will ensure that students can access education in a reliable digital environment.

From an academic perspective, the study contributes meaningfully to existing scholarship by bridging a notable gap in the literature. While many studies have investigated AI's role in teaching and learning, very few have examined its application and effect as constraint to student's creativity and problem solving skills in educational institutions particularly in the Nigerian context. By providing empirical insights into how AI influences academic outcomes of students within universities, and colleges of education, the research adds valuable knowledge to fields such as educational technology, computer science, digital governance, and educational management. It will serve as a useful resource for scholars, students, and researchers interested in the intersection of AI in education.

Institutionally, the study has practical relevance. As the institutions increasingly depends on digital platforms for academic and administrative functions, ensuring proper integration of its digital infrastructure is vital for preserving academic integrity and maintaining operational efficiency. The findings will assist the institutions in identifying existing gaps in AI usage among its students, evaluating its preparedness for AI-enhanced solutions, and formulating strategic plans for adopting modern, context-specific technological safeguards. Moreover, the recommendations from this study could inform policy revisions in these institutions ICT framework, guide investments in digital infrastructure, support students training initiatives and promote a culture of awareness across these institutions.

From a policy standpoint, the study aligns with and supports Nigeria's Digital Economy Policy and Strategy (2020–2030), which emphasizes secure, intelligent, and inclusive digital infrastructure. The research findings will be of interest to policymakers, including the Federal Ministry of Education, the National Universities Commission (NUC), the National Commission for Colleges of Education (NCCE), and the National Information Technology Development Agency (NITDA). Insights from this study may guide the development of national strategies for AI integration in education, inform data protection regulations, and shape policies around capacity building and ethical AI deployment in academic settings.

Globally, this study holds comparative value, particularly for other developing nations and African institutions. As these institutions strive to digitize their academic systems, it could serve as a benchmark or pilot model for scalable AI-driven frameworks. Thus, the findings are relevant beyond Delta State of Nigeria, offering lessons that can be adapted to comparable educational environments globally.

Methodology

Research Design

The study used an ex- post facto research design. It was descriptive in nature. Consequently, there was no manipulation of variables because they have already occurred.

Participants

The population was all the university and college of education students in Delta State of Nigeria in the 202/2025 academic session. These institutions include 14 universities, and 4 colleges of education encompassing both public – federal, state government owned institutions and private owned institutions. (*Source: Delta State Ministry of Higher Education, Asaba, 2025)*

Sampling and Sampling Technique

A total of 1,000 students were sampled, comprising of 100 colleges of education students and 900 universities students. The selection was drawn from nine (9) universities and three (3) colleges of education across the three senatorial districts namely: Delta South, Delta North and Delta Central which made up the state through the stratified random sampling technique. Three (3) universities and one (1) college of education were stratified from each senatorial district. This gives a total of twelve (12) institutions that was used for the study. The selection was limited to the faculties or schools of education within these institutions.

Research Instrument

Data were collected using the Artificial Intelligence Usage in Higher Education Institutions Questionnaire (AIUHEIQ), which had two sections: Section A captured demographic data (age, gender, education), and Section B assessed aspects of AI usage in higher education, serving as the study's independent variable. Responses in Section B measured participants' frequency and methods of AI use on a four-point Likert scale: Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD).

Validity of the Instrument

The instrument was duly validated with face and content validity by three experts in measurement and evaluation, science education, and higher education. The corrections and criticisms made on the instrument were considered and incorporated into the final draft.

Reliability of the Instrument

The test- re- test method of reliability established the stability of the questionnaire through the Cronbach Alpha coefficient, which gave an index of 0.75

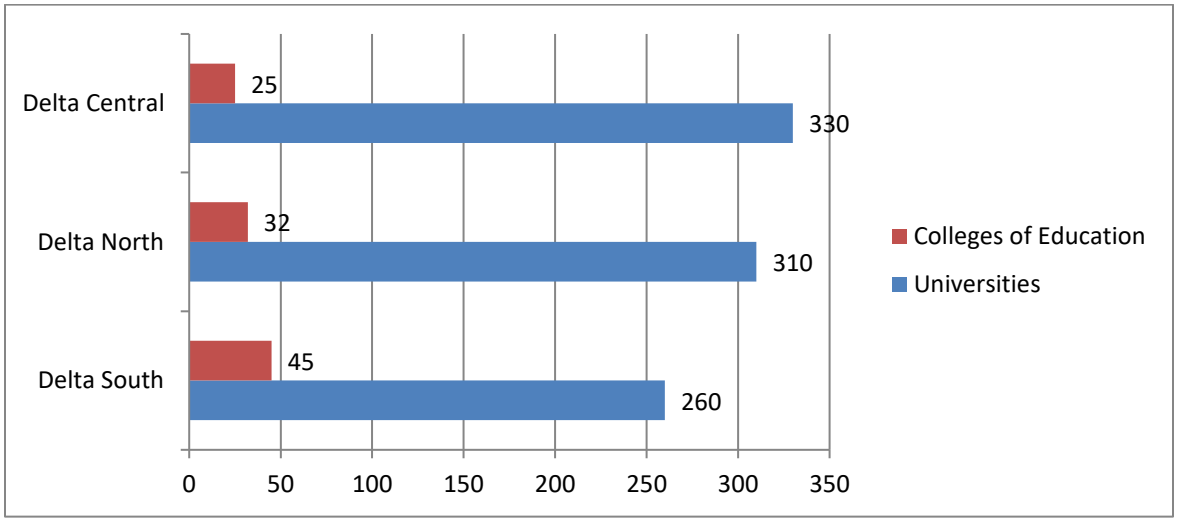
Data Analysis

The collation of the generated data from the questionnaire was done using the simple percentages, mean scores, and standard deviations. A benchmark value of 2.50 or higher was set as the acceptance criterion.

Results

Pictorial Distribution of Sampled Respondents

Figure 1: Distribution of Sampled Students in Universities and Colleges of Education drawn from the various Senatorial Districts of Delta State, Nigeria



Bar – Chart showing the Distribution of Sampled Students

Research Question One: What are the ways the use of AI-powered tools limit the creativity and problem-solving skills of students in universities and colleges of education, in Delta State, Nigeria?

Table 1

AI-powered tools usage constraints on students' creativity and problem-solving skills

N = 1000

S/N	Items: AI powered tools usage constrain on students' creativity and problem-solving skills	SA	A	D	SD	Mean	Staard. Dev.	Remark
1	Used AI-powered tools to create something innovative, automate routine task, freeing up time for creative thinking	288 (28.8%)	310 (31%)	290 (29%)	112 (11.2%)	2.90	.90	Agreed
2	Relying on AI-powered tools do not limit my problem –solving skills	234 (23.4%)	321 (32.1%)	245 (24.5%)	200 (20%)	2.83	.71	Agreed
3	AI-powered tools harness students' creativity and problem solving skills	250 (25%)	297 (27.7%)	198 (19.8%)	255 (25.5%)	2.88	.86	Agreed
4	AI tools help to solve complex problems which spark ideas and inspiration	179 (17.9%)	412 (41.2%)	234 (23.4%)	175 (17.5%)	2.98	.82	Agreed
5	AI-powered tools limit students' creativity and problem-solving skills,	241 (24.1%)	160 (16%)	292 (29.2%)	307 (30.7%)	2.24	.65	Disagreed
	Cumulative Average Mean					**2.76**		

Source: Fieldwork, 2025

In the results presented on Table 1, it was indicative that the participants agreed AI-powered tools usage does not impde students' creativity and problem-solving skills. Rather, these tools assist students in addressing complex problems and foster innovation. The overall average score was 2.76.

Research Question Two: What responsible and productive strategies can be adopted on AI-powered tools use by students at the universities and colleges of education, in Delta State, Nigeria?

Table 2

Strategies for ensuring responsible and productive AI-powered tools usage by students

N = 1000

S/N	Items: on strategies for responsible and productive usage of AI powered tools	SA	A	D	SD	Mean	Stand. Dev.	Remark
6	Awareness of institutional AI usage policies	255 (25.5%)	276 (27.6%)	208 (20.8%)	261 (26.1%)	3.56	.94	Agreed
7	AI should be used in classrooms with guidelines	460 (46%)	367 (36.7%)	160 (16%)	13 (1.3%)	3.35	.90	Agreed
8	Students should be taught AI literacy	306 (30.6%)	352 (35.2%)	189 (18.9%)	153 (15.3%)	2.84	.88	Agreed
9	Foster collaboration	98 (9.8%)	212 (21.2%)	385 (38.5%)	305 (30.5%)	2.48	.72	Disagreed
10	Promote transparency	321 (32.1%)	233 (23.3%)	245 (24.5%)	201 (20.1%)	2.78	.82	Agreed
	Cumulative Average Mean					3.00		

Source: Fieldwork, 2025

Table 2 revealed that participants identified the establishment and regular updating of clear guidelines for AI use as essential for responsible and effective implementation in universities and colleges in Delta State of Nigeria. The overall average mean score came out as 3.00.

Discussion

The analysis in Table 1, for research question one shows that students who use AI-powered tools do not lose creativity and problem solving skills. Instead AI-powered tools raise student creativity and problem solving abilities which adds support and innovation to student learning. The finding at variance, with the findings of Holmes et al. (2022), Zhou et al. (2020), and Bali (2023), who warned against over reliance on AI and innovative electronic gadgets. They asserted that generative AI may reduce creative thinking skills and may lead to passive learning. The finding of this study suggests that AI software and AI tools simulate a cognitive process and that AI tools provide support for student success, in academics.

The findings in Table 2, regarding the research question two, revealed that the establishment of clear rules as well as a regular review of these rules on AI usage by students is pivotal for a responsible and effective implementation in universities and colleges of education in Delta State. The finding corroborates with the finding of Sternberg (2018) and Bali (2023), which emphasized the importance of clear guidelines, AI-focused instruction, digital skills development, and ethical oversight in higher educational institutions.

Conclusion

The study concluded that when students use AI-powered tools, it does not limit their creativity or their problem solving in the universities and colleges of education, in Delta State, Nigeria. Instead AI-powered tools boost creativity, increase independence and improve performance, help generate ideas and improve writing tasks. The study also revealed that an ethical and instructional guideline for AI tool usage by students is needed as the key measure to it responsible and productive use. This will guide the productive use of the technology driven gadgets or tools. Thus, supporting creative thinking, originality and integrity of learning in universities and colleges of education

Recommendations

The study offered the following recommendations based on the findings:

1. The universities and colleges of education management should enact clear ethical and pedagogical guidelines for AI-powered tools usage by students which should aimed at encouraging standard decent practices and elimination of all manner of academic dishonesty.
2. Universities and Colleges of education management should organize AI literacy programs such as workshops and conferences to teach students about the role of AI in teaching and learning.
3. The government, academia, the private sector and the communities should form multi-stakeholder partnerships aimed to design, fund and run AI initiatives, in the educational institutions.
4. Universities and Colleges of education management should also provide students with infrastructural support, specifying access to affordable digital devices and reliable internet to ensure equitable participation in AI-driven learning.

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