THE EFFECT OF ARTIFICIAL INTELLIGENCE ON ACADEMIC PERFORMANCE OF CIVIL ENGINEERING UNIVERSITY STUDENTS IN THE NIGER DELTA REGION OF NIGERIA

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Abstract

The study is to investigate the perceived effects Artificial Intelligence on the academic performance of Civil Engineering university students in the Niger delta region. To aid this investigation, two research questions and two hypotheses were put forward. A sample of 365 student's participants determined using Taro Yamen's method was randomly selected from the population of 3200 students from the University of Port Harcourt (UNIPORT) and the Delta State University (DELSU). Mean and standard deviation were used to answer the research questions while the hypotheses were tested at 0.05 level of significance using Z-test statistics. Findings revealed that artificial intelligence significantly improved the academic performance of final year civil Engineering students and the application of artificial intelligence in final year research facilitates knowledge acquisition and data processing. Consequently, it was recommended among others that federal and state governments should provide our universities with modern artificial intelligent facilities, train and update the civil Engineering students to meet the trend in technological advancement.
Keywords: Artificial Intelligence, final year, Civil Engineering, Academic Performance.

I.   Introduction

Artificial Intelligence (AI) is revolutionizing various industries globally, including education, where civil engineering, is no exception. AI offers a myriad of opportunities and challenges for students in tertiary education; civil engineering students not exceptional. As the universal trend of integrating AI into education and professional fields grows, Nigerian universities, especially in the Niger-delta region, are beginning to see its profound impacts. This paper explores the effects and impacts of AI on final-year civil engineering students, highlighting both positive and negative consequences.

AI refers to the simulation of human intelligence processes by machines, especially computer systems. In civil engineering, AI applications include predictive modeling, automated design, project management, construction planning, structural health monitoring, and more. Studies have shown that AI-powered platforms can personalize the learning experience by adapting to individual student needs and learning styles (Jones & Smith, 2021). This can be achieved through intelligent tutoring systems, adaptive learning platforms, and personalized feedback mechanisms. For final-year civil engineering students in the Niger delta region of Nigeria, exposure to AI could be a transformative experience, offering those valuable skills that will make them competitive in the global job market. The integration of AI in higher education is rapidly transforming learning paradigms (Jones & Smith, 2021). In civil engineering, AI offers significant potential for enhancing student learning, fostering innovations, and preparing graduates for the demands of the 21st-century workforce (Ekwe & Onyema, 2021).

Artificial Intelligence technologies provide students with access to interactive learning tools such as AI-based tutoring systems, virtual assistants, and adaptive learning platforms that can personalize the learning experience. AI-based tools can help tailor learning materials to individual student needs, addressing the diverse learning paces and styles found among students. AI enables students to access and analyze large datasets

related to construction projects, obtain certain information, weather patterns, and traffic flow. This real-world data exposure enhances problem-solving skills and fosters a deeper understanding of real-world engineering challenges (Ogbulu & Obi, 2020). AI applications often use real-world data for simulations and project-based learning, enabling students to work on current, relevant problems. Tools like AI-powered project management software foster collaboration by helping students coordinate tasks and track progress in team projects. Exposure to AI fosters computational thinking, data analysis, and machine learning skills, which are highly valuable in modern engineering (Ajayi & Nnamdi, 2022). AI tools can enhance project quality, innovations, and efficiency (Akinwale & Chigozie, 2023).

AI-driven tools in civil engineering, such as machine learning algorithms for structural analysis, have created new skill demands for future engineers. Students exposed to these tools gain an edge in understanding cutting-edge engineering technologies, which are increasingly in demand by employers. AI helps students develop critical thinking skills and the ability to solve complex engineering problems using algorithms. Exposure to AI-based software for modeling, design, and optimization helps students grasp machine learning concepts that are relevant in real-world civil engineering projects. Students learn how to incorporate AI into designing and managing automated systems in construction and infrastructure projects.

AI technologies such as robotics, drones, and automated construction equipment are transforming the way civil engineering projects are executed. For final-year students, exposure to these technologies can foster an understanding of their real-world applications in design, construction, and maintenance. Construction Automation: Students learn how AI-powered systems can automate tasks like excavation, surveying, site inspection and material handling, which leads to faster and more efficient construction. AI tools, such as generative design software, help students understand how artificial intelligence can create innovative, efficient structures that were previously unimaginable.

Technologically, AI equips civil engineering students with the ability to utilize big data for making informed decisions about construction materials, designs, and environmental factors. Students are introduced to AI-based systems that analyze large datasets to optimize construction processes, identify risks, and predict project outcomes. AI fosters the development of crucial 21st-century skills, such as computational thinking, data analysis, and problem-solving (Ajayi & Nnamdi, 2022), Also, AI tools can enhance project quality, innovation, and efficiency by enabling students to explore a wider range of design solutions (Akinwale & Chigozie, 2023).AI tools that analyze data from past construction projects allow students to anticipate potential risks and make better-informed decisions regarding safety, cost, and timelines.

Despite the numerous advantages, the integration of AI in the education of civil engineering students in Niger Delta universities comes with challenges. These include infrastructure issues, limited access to AI resources, and lack of trained faculty to effectively teach AI concepts. Other challenges include limited access to resources, facility update/training, and ethical considerations Oluwaseun, T. M., & Adebisi, O. (2021). Many universities in Niger Delta lack access to AI tools, software, and technologies, limiting students' exposure. There is shortage of faculty who are well-trained in AI applications in civil engineering, which limits students' ability to learn advanced AI techniques. Also, AI software, hardware, and resources are often expensive, creating barriers for implementation in public universities.

AI brings about ethical and social concerns, including the potential for bias in algorithms, privacy issues, and the displacement of traditional engineering jobs. Students must be aware of these implications as they prepare to enter the workforce. AI models can perpetuate biases if not properly designed, which could affect the fairness of construction decisions and project outcomes Nwankwo, E. M., & Okoro, O. (2022). Automation powered by AI could lead to job displacement in the engineering and construction sector, making it important for students to focus on acquiring adaptable skills. And finally, the use of AI to gather data on construction sites may lead to concerns about privacy and data security.

II.   Statement of the Problem

The integration of Artificial Intelligence (AI) into civil engineering education is transforming traditional learning paradigms. In Nigerian universities, the adoption of AI technologies presents both opportunities and challenges for civil engineering students; there is limited empirical research on its specific impact within the Nigerian context. Essien, A., & Essien, G. (2024). Did a research exploring socio-cultural influences on generative AI engagement in Nigerian higher education. However, concerns have been raised regarding the over-reliance on AI tools by students, potentially leading to academic dishonesty and a decline in critical thinking skills.

III.   Purpose of the Study

The main purpose of this study was to determine the effect Artificial Intelligence on the academic performance of Civil Engineering university students. Specifically, the study sought to achieve the following;

To determine the extent to which individualized study using AI influences Civil Engineering student's academic performance in Niger delta region.

To determine the extent to which the application of Artificial Intelligence in the search and acquisition of knowledge influences the academic performances of Civil Engineering university students in the Niger delta.

Research Questions

The study sought answers to the research questions;

To what extent does individualized study using Artificial intelligence influence the academic performance of Civil engineering students in Niger delta region?

To what extent does application of AI to search for, acquire and update knowledge affect the academic performance of Civil engineering students in Niger delta region?

Research Hypothesis

The following null hypothesis were formulated and tested at 0.05 level of significance:

1. There is no significant difference in the mean ratings of Civil Engineering students of University of Port Harcourt and Delta State University regarding the influence of individualized study using Artificial intelligence on Students academic performance.

2. There is no significant difference in the mean rating of students of University of Port Harcourt and Delta State University with regards to the influence the application of AI to search for, acquire and update knowledge has on Civil Engineering students' academic performance.

IV.   Methodology

The study adopted the descriptive survey research method. The survey was conducted to determine the effect Artificial Intelligence on Civil Engineering of students' academic performance in Niger delta region Universities. A total of three thousand and two hundred (3200) levels 100 to 500 Civil Engineering students for the 2023/2024 academic session, comprising 1211 from RSU and 1989 from DELSU, made up the population for the study. A sample of three hundred and fifty-six (356), determined using Taro Yamen's formula and distributed proportionately, yielding 135 for RSU and 221 for UNIPORT; were randomly selected from the Universities. A self-structured questionnaire titled "Effects of AI on Academic Performance Civil Engineering Students (EAIAPCES)", eliciting information on using AI for independent individualized study and the application of AI for knowledge acquisition and update was used for data collection. The questionnaire was validated by two experts from Educational Measurement and Evaluation. Reliability of the instrument was established using test-retest and the Pearson Product Moment Correlation, an r value of 0.65 was obtained. Copies of the questionnaire were administered to the respondents and their responses were solely used for data analysis. The response pattern of the instrument was a four point Likert type rating scale of Very High Extent (VHE), High Extent (HE), Low Extent (LE), and Very Low Extent (VLE). Data obtained from the questionnaire were subjected to descriptive and inferential statistics. The mean and Standard deviations were used to answer the research questions while z-test was used to test hypothesis at 0.05 level of significance. A

bench mark mean of 2.5 obtained by taking the mean of the rating scale of the instrument was set for decision making. Any mean response of 2.5 and above was considered high extent, otherwise, low extent.

V.   Results

Research Question 1: To what extent does individualized study using AI affect Civil Engineering Students academic performance in the Niger delta Universities?

Table 1: Mean Ratings of Students on the effect of individualized study using AI on Civil Engineering students' academic performance.

S/N	Description	UNIPORT (n=135)		DELSU(n= 221)		Average		Remarks
		X	SD	X	SD	X/SD		
1	The use of AI to access information of various forms enhances Civil engineering students academic performance	2.99	0.21	3.31	0.19	3.2	0.02	He
2	AI usage has made a shift from teacher centered learning to student competency-based learning which enhance their academic performance	2.69	0.24	3.40	0.19	3.4		He
3	With AI, student ability to learn at any time has enhanced their academic performance.	3.61	0.25	3.49	0.2	3.6	0.23	He
4	Students' academic performance is enhanced as Teachers take mentorroles rather than content experts, with the application of AI.	3.40	0.25	3.60	0.21			He
5	The adoption of AI supports students' independent knowledge construction and this enhances their academic performance	3.20	0.24	3.11	0.17	3.2	0.20	He
	Grand mean	3.30		3.41		3.38		He

Result from Table 1 above shows the item by item analysis of the mean ratings of students on the effect of individualized study using AI on Civil Engineering students' academic performance. From the table it could be seen that students aligned to the opinion that the use of AI to access information enhances their academic performance, with a mean response of 3.20 and Standard Deviation of 0.02. Also that with AI, student ability to learn at any time has enhanced their academic performance (mean = 3.60; SD = 0.23) and that the use of AI supports students' knowledge construction which enhances their academic performance (mean =3.20, SD = 0.20). On the whole, students of both institutions concurs that AI enhances students' ability to engage in individualized study in Civil Engineering to a high extent with mean ratings of 3.30 and 3.40. The low values of the standard deviations in each case are indications that the responses are homogeneous.

Research Question 2: To what extent does application of AI to search for, acquire and update knowledge affect Civil Engineering students' academic performance in Niger Delta Universities?

Table 2; Mean Ratings of final year Students on how the application of AI to search for, acquire and update knowledge Civil Engineering influence students' academic performance in Niger Delta Universities.

S/N	Description	UNIPORT (n=135)	DELSU(n= 221)	Average	Remarks

		X	SD	X	SD	X	
1	Effective and efficient use of information to search, acquired and updated knowledge enhances academic performance	2.91	0.20	2.61	0.15	2.8	He
2	Adopting AI to observe, evaluate and process information acquired enhances academic performances.	2.71	0.21	2.80	0.16	2.8	He
3	Adoption of AI in learning aided in the process of developing students' information literacy skills.	3.01	0.20	2.70	0.15	2.90	He
4	Online based information has become students' main source of information that enhances their academic performance.	2.60	0.19	2.50	0.15	2.6	He
5	Online technology using AI has enabled students to access information anytime, thus enhancing their academic performance	3.10	0.22	2.90	0.16	3.00	He
	Grand mean	2.90		2.70		2.82	He

Table 2 revealed that the final year students of UNIPORT and DELSU have the ability to search for, acquire and update their knowledge through AI. The item by item analysis shows that each of the items has mean that is above the decision mean of 2.50 with grand mean of 2.90 and 2.70 respectively. This implies that the students of the two Niger Delta universities agree that the application of AI to search for, acquire and update knowledge influence Civil Engineering students' academic performance to a high extent. This opinion is a general view of all the respondents of both institutions as it is indicated by the low values of the standard deviations.

Hypothesis Testing

Hypothesis 1: There is no significant difference in the mean rating of Civil Engineering students of University of Port Harcourt and Delta State University regarding the effect of individualized study acquires using AI on academic performance of Civil Engineering Students.

Table 3:   z-test analysis of responses of University of Port Harcourt and Delta State University Students on the influence of individualized study using AI on academic performance of Civil Engineering students.

Variables	N	Mean	SD	Std Error.	z-cal	z-crit	Remarks
UNIPORT	135	3.30	0.24	0.02		1.96	Reject
DELSU	221	3.40	0.19		5.00		

Table 3 above is a Z-test analysis of mean differences between students of UNIPORT and DELSU on the effects of the students' ability to engage in individualized study. It could be seen from the analysis that the calculated z-value (5.00) is greater than the critical value (1.96) hence the null hypothesis is of no significant difference hence it is rejected. This means that the observed mean difference is significant and cannot be attributed to sampling error. This implies that, while respondents from both schools rated a high extent in their responses, there is variation in the level of rating between the two schools.

Hypothesis 2

There is no significant difference in the mean rating of students of University of Port Harcourt and Delta State University with regards to the effect of the application of AI to search for, acquire and update knowledge has on the academic performance Civil Engineering students'.

Table 4:   z-test Analysis of ratings University Of Port Harcourt and Delta State University Students with regards to the influence the application of AI to search for, acquire and update knowledge on the academic performance Civil Engineering students'.

Variables	N	Mean	SD	Std Error.	z-cal	z-crit	Remarks
UNIPORT	135	2.90	0.20	0.02	10.00	1.95	Reject
DELSU	221	2.70	0.15				

From table 4 shown, the computed value of z is greater than or critical value. This shows that the observed mean difference cannot be due to chance, hence the null hypothesis is rejected. Here again while both schools' respondents rated high extent in their responses, there is difference in their mean ratings which gave rise to the mean difference. This suggests that there is significant difference between the mean response of students of UNIPORT and DELSU with regards to the effect of application of AI to search for, acquire and update knowledge on the academic performance of Civil Engineering students' although students from both institutions record agrees that the effect is to a high extent.

VI.   Discussion of Findings

This study investigated perceived effect of Artificial Intelligence Technology on the academic performance Civil Engineering students' in the Niger Delta Universities. It examined the perception of final year students towards the use of Artificial intelligence in learning and its perceived effect on academic performance. Findings showed that individualized study using AI affects academic performance of Civil engineering Students'. The outcome of this study is consistent with that of (Jones & Smith, 2021).that opines that the integration of AI in higher education is rapidly transforming learning paradigms they justified the use of AI as a conventional learning process whereby learning emphasis was given on contents, and teachers teach through lectures and presentation which can be facilitated by the use of AI; Competent Course Structure which applies advanced technology and practical approach by way of access to information types and in different forms, student-centered learning through online access and learning environment concentrated on wide access and inquiry. The second finding in this study showed that application of AI to search for, acquire and update knowledge affects the academic performance Civil Engineering students' in Universities in the Niger delta region and that significant difference exists between the mean response of UNIPORT and DELSU students. Respondents from both schools bear a common view as they rated high extent in their responses, however, they differ significantly in their levels of rating. In other words, the direction of their opinions are the same but the level of agreement is not in line with (Ekwe & Onyema, 2021) that observed emphatically that AI offers significant potentials for enhancing student learning, fostering innovation, and preparing graduates for the demands of the 21st-century workforce

VII.   Conclusion

Artificial Intelligence (AI) is rapidly reshaping industries worldwide, and Civil Engineering is no exception. In the same vain, Artificial Intelligence (AI) is rapidly transforming the landscape of Civil Engineering as an enviable professional area. In Nigeria, the integration of AI technologies into the curriculum of educating Civil Engineering students is crucial for preparing them for the demands of the modern workforce. Also, AI is poised to revolutionize the way civil engineering projects are conceived, designed, and executed. This transformation will significantly impact the roles and responsibilities of final-year civil engineering students, as well as the broader profession.

VIII. Recommendations

Based on the foregoing, the following recommendations were made;

Institutions and authorities concerned including local education authorities should provide AI facilities for effective learning of Civil Engineering in the learning institutions. This will promote individualized study acquire knowledge using AI which in turn enhances students' academic performance.

Students should be encouraged to utilize AI facilities in learning of Civil Engineering. This will help them to search for, acquire and update their knowledge for speedy enhancement of their academic performance.
Governmental agencies and philanthropic organizations should assist in the provision of AI facilities in universities as to enhance the teaching and learning process. Leaving it in the hand of government alone would not yield the desired result especially considering the importance of AI as revealed in this research.

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