

# Perceived Effect Of Artificial Intelligence Tools On The Academic Performance Of Students In Public Universities In Anambra State

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*Abstract: This study examined perceived effect of artificial intelligence tools on the academic performance of students in public universities in Anambra State. The study adopted descriptive survey design. The population was made up of 61,888 undergraduate students in the regular programme of Nnamdi Azikiwe University and Chukwuemeka Odumegwu Ojukwu University for the 2022/2023 academic session. A sample size of 300 undergraduate students were selected from both universities using multi-stage sampling procedure. The instrument used for data collection was a structured four-point Likert scale questionnaire titled Perceived Effect of Artificial Intelligence Tools on the Academic Performance of Students in Public Universities in Anambra State Questionnaire (PEAITAPSPUASQ) developed by the researchers. The instrument was validated by experts in the Faculty of Education, Nnamdi Azikiwe University, Awka. The reliability of the instrument was established using Cronbach-Alpha which yielded a reliability coefficient of .82. The survey data collected were analyzed using Pearson product moment correlation (PPMC). Findings of the study revealed there was a positive significant relationship of artificial intelligence (AI) tools and the learning abilities of students in public universities in Anambra State ( $r = .503, N = 300, p < .05$ ), also result reveals that there was a positive significant relationship of artificial intelligence (AI) tools on the problem-solving skills of students in public universities in Anambra State ( $r = .462^{**}, N = 300, p < .05$ ) and there was a positive significant relationship of artificial intelligence (AI) tools on the critical thinking abilities of students in public universities in Anambra State ( $r = .646^{**}, N = 300, p < .05$ ). The study therefore recommended among others, that university lecturers should integrate Artificial Intelligence (AI) tools in their work, receive training, and explore ways to use them for developing students' skills.*

## I. INTRODUCTION

Society has undergone a significant transformation from a traditionally driven society to a current knowledge-based society where creativity and innovation are the driving forces. Artificial Intelligence (AI) has become a widely discussed topic in the present age as technology continues to advance rapidly. Krstić, Aleksić, and Krstić (2022) suggest that artificial intelligence is now recognized as the technology of the future globally and nationally. According to Jain & Jain (2019), the AI technological revolution has taken place in

many parts of the world in recent decades. It aims to replicate human intelligence through computers, enabling them to learn.

Due to the numerous application areas of artificial intelligence, it is challenging to establish a standard definition of the concept. Tuomi (2018) highlights that there are numerous interpretations of artificial intelligence, including machines that think, understand language, solve problems, diagnose medical conditions, drive cars, play chess, and paint like Van Gogh. Nilsson in Tuomi (2018) defines artificial intelligence as a computer system capable of carrying out tasks typically associated with intelligent beings. However, this definition has its limitations as it requires defining

intelligence, making it a tautological concept. As a result, artificial intelligence is now commonly defined as a scientific discipline focused on creating machines that can operate effectively and efficiently in their surroundings.

Furthermore, Hussain, Shamim, Sankar, Kumar, Samanta, and Sakhare (2022) asserts that artificial intelligence suggests the image of a powerful computer, equipped with advanced processing abilities, including adaptable behaviors such as incorporating sensors and other features that mimic human cognition and capabilities, thereby enhancing its interaction with people. From these definitions, it is clear that artificial intelligence is the result of advancements in computers, computer technologies, machines, and information communication technologies, allowing computers to perform functions that are almost human-like. There is no denying that artificial intelligence is one of the pivotal technologies revolutionizing education globally.

Education is the foundation for progress in every country. As stated by Agih (2015), it lays the base for literacy, skill development, technological advancements, and the utilization of natural resources for growth. Universities, being the forefront of tertiary education, play a crucial role in the development of a nation. They are responsible for shaping human capital, conducting research and fostering innovation across various industries. Iviemu (2021) notes that tertiary institutions have the obligation to produce high-quality graduates who will become prominent leaders and skilled workers in their respective fields.

Recently, artificial intelligence has been tackling challenges in education, particularly in universities, due to the limitations of traditional teaching methods and the complexity of the educational system. E-learning has made a wealth of data accessible, allowing AI to find smart solutions to complex education problems. Studies show that AI is crucial in higher education, particularly in universities, as it provides flexible learning opportunities for students through the use of innovative technologies. Artificial intelligence tools in education such as ChatGPT, Scikit Learn, TensorFlow, PyTorch, CNTK, Caffe, Apache MXNet, Keras, OpenNN, AutoML, H2O, OpenAI, Grammarly, and Quillbox are making teaching and learning easier and more efficient.

Artificial intelligence tools have been said to have a substantial impact on university students' academic performance. According to Nwosu and Okoli (2019), academic performance refers to the quantification of learning outcomes in a systematic and deliberate manner. This includes evaluating students' academic advancement through their grades, test scores, attendance, class participation, study habits, and other crucial indicators of academic success.

Artificial intelligence tools in education benefit university students by promoting organization, improving study habits, providing individualized guidance, and improving critical thinking abilities. Huang (2021) highlights the benefits of using artificial intelligence tools in education. These tools can assist students in keeping track of their studies, creating more effective study plans, receiving tailored instruction, and enhancing their problem-solving abilities. By using these tools, students can identify their educational needs, foster self-directed learning habits, and improve their critical and logical thinking skills. This highlights the significant impact that

artificial intelligence tools can have on student academic performance, and explains why universities across the world, including those in Nigeria, are increasingly adopting these innovative tools. In light of this, this study aims to investigate perceived effects of artificial intelligence (AI) tools on the academic performance of students in public universities in Anambra State.

#### PURPOSE OF THE STUDY

The purpose of this study is to examine the perceived effects of artificial intelligence (AI) tools on the academic performance of students in public universities in Anambra State. Specifically, the study seeks:

- ✓ To investigate the perceived effect of artificial intelligence (AI) tools on the learning abilities of students in public universities in Anambra State.
- ✓ To examine the perceived effect of artificial intelligence (AI) tools on the problem-solving skills of students in public universities in Anambra State.
- ✓ To determine the perceived effect of artificial intelligence (AI) tools on the critical thinking abilities of students in public universities in Anambra State.

#### RESEARCH QUESTIONS

- ✓ What is the relationship of artificial intelligence (AI) tools and the learning abilities of students in public universities in Anambra State?
- ✓ What is the relationship of artificial intelligence (AI) tools on the problem-solving skills of students in public universities in Anambra State?
- ✓ What is the relationship of artificial intelligence (AI) tools on the critical thinking abilities of students in public universities in Anambra State?

This section reviews empirical literature related to this study. Owolabi, Abayomi, Aderibigbe, Kemdi, Oluwaseun and Okorie (2022) investigated the awareness and readiness for Artificial Intelligence (AI) among polytechnic students in Nigeria. The study adopted descriptive survey design. Five Polytechnics were purposively selected for the study. The study population comprised of three hundred and twenty (320) final year students registered as members in the selected polytechnic libraries. A questionnaire was used for data collection. Purposive sampling was used to select one hundred (100) respondents from each of the polytechnics. Data collected was analysed using mean scores. Findings revealed that the students were aware of the existence of Artificial Intelligence usage in library operations and gained awareness during library orientation programmes. The students admitted that they needed to have basic computer skills to be relevant in this era. The major anticipated constraint in the use of AI is unstable power supply. The study recommends the need for polytechnic library managements to harness alternative sources of power supply, and the need to include practical ICT training in the curriculum. The study by Owolabi et al. (2022) is related to the present study in terms of research design, instrument for data collection and method of data analysis. However, both studies differ in area of study, sampling technique and sample size.

Ayanwale, Sanusi, Adelana, Aruleba, and Oyelere (2022), examined the factors influencing the behavioural intention and readiness of Nigerian in-service teachers to teach artificial intelligence. A total of 368 teachers, from elementary to high school participated in the study. The study utilised quantitative methodology using variance-based structural equation modelling to understand the relationship among the eight variables (AI anxiety, perceived usefulness, AI for social good, Attitude towards using AI, perceived confidence in teaching AI, relevance of AI, AI readiness, and behavioural intention) considered in the study. Data utilised in the study was collected using Google form questionnaire. Partial least squares structural equation modelling (PLS-SEM) focusing on the analysis of variance was used to test the hypothesised model using Statistical package for Social Science (SPSS) version 28. The result indicated that confidence in teaching AI predicts intention to teach AI while AI relevance strongly predicts readiness to teach AI. While other factors influence the teaching of AI, anxiety and social good could not predict teachers' intention and readiness to implement AI in classrooms respectively. We discussed the implication of our findings in relation to AI implementation in schools and highlight future directions. Ayanwale et al. (2022) is related to the present study in terms of instrument for data collection.

Umoren, Odufejo, and Jagun, (2021). Students' social networking, human-artificial intelligence interface skills and human-centred behaviour intentions in Lagos State, Nigeria. The descriptive survey research design was used, with one research question and three hypotheses tested at 0.05 level of significance guiding the study. A total of 520 participants were derived using purposive sampling techniques from six adult education centres in three randomly selected local government areas in Lagos State. The instrument used for data collection was a self-designed and validated questionnaire with reliability coefficient of 0.70. Data collected were analysed using means, standard deviation, Pearson Product-Moment correlation coefficient and Regression analytical statistical tools. The findings of the study reveal that students' level of approval for AI was low. It was also revealed that there is a significant relationship between students' level of social networking and AI analytical skill. The study recommended that there should be a need to investigate if human-centred behaviours can affect human-AI interface skills. The study by Umoren et al. (2021) is related to the present study in terms of research design, instrument for data collection and method of data analysis.

Mohammad and Mansour (2020) examined the effect of the teaching method using educational software based on artificial intelligence in the academic achievement of 10th-grade students in computer science in Jordan and their attitudes towards it. To achieve the goal of this study, a computerized software was designed to be applied to a purposefully selected sample consisting of (50) 10th-grade students at the University of Jordan School. The study sample was randomly distributed into two groups: an experimental sample taught using the educational software, and a control sample taught in the traditional method, where the researcher prepared an achievement test to measure the academic achievement of the 10th-grade students in the Computer Science Subject, where the validity and reliability of the test

has been validated, and the test-retest reliability coefficient was (0.86). A questionnaire was prepared for the attitudes, where their validity and reliability were validated. The reliability factor of the questionnaire based on Cronbach's alpha equation was (0.01). To analyze the results, an analysis of covariance (ANCOVA) was used, where the results of the study showed that there are statistically significant differences in favour of the experimental group taught using educational software based on artificial intelligence in learning computer science subject. The results also showed that there are medium positive attitudes of the experimental group towards educational software. The study recommended designing and developing computerized software in the field of teaching computer science subjects and training and encouraging teachers to use artificial intelligence-based learning in the field of basic education. The study by Mohammad and Mansour (2020) is related to the present study in terms of content scope and instrument for data collection.

Jain and Jain (2019) examined the role of artificial intelligence in higher education using higher education institutes of Udaipur, Rajasthan. The study adopted descriptive survey design. Structured questionnaires were framed and data collection is done with the help of them taking teachers perception as the focal point. To achieve the objectives of the study statistical tools that were applied for analysing the collected data are frequency tables/graphs and one-way ANNOVA. Results of the study shows that implementing AI in higher education institutes is enhancing learning capacities of students up to a large extent and AI holds massive future prospects in higher education sector. Based on the findings, the study recommended among others that higher education institutes should train and develop their students to upgrade them to face the challenge of the AI revolution and fight successfully in the AI age. The study by Jain and Jain (2019) is related to the present study in terms content scope, research design and instrument for data collection.

## II. METHODOLOGY

In this chapter, the researcher outlines the steps of the method used in this study. This includes; Study Design, Area of Study, Population of the Study, Validation of the Instrument, Reliability of the Instrument, Method of Data Collection, and Method of Data Analysis.

### RESEARCH DESIGN

The research design chosen for this study was descriptive survey design, which aims to systematically collect data and describe the characteristics, features, or facts about a given population (Nworgu, 2015). This design was selected to gather data on the perceived effect of artificial intelligence (AI) tools on the academic performance of students in public universities in Anambra State. The data collected from the study population will be utilized to make informed generalizations.

## AREA OF THE STUDY

The study was carried out in Nnamdi Azikiwe University's Awka and Chukwuemeka Odumegwu Ojukwu University, Igbariam. Nnamdi Azikiwe University as one of only federal university in Anambra State, was established by the Government of the old Anambra through Law No. 7 of 30th July 1980, originating from the defunct Anambra State University of Technology (ASUTECH). ASUTECH operated as a multi-campus university with campuses located in Abakiliki, Enugu, Awka, and Nnewi until 1991. Anambra State Edict No.5 of November 26, 1991, merged the Awka and Nnewi campuses of ASUTECH to form Nnamdi Azikiwe University. The Federal Government later took over the university by Decree No. 34 of July 15, 1992. Currently, the university is governed by the Nnamdi Azikiwe University Act Cap N139 Laws of the Federation of Nigeria 2004 (Nnamdi Azikiwe University, 2023).

On the other hand, Chukwuemeka Odumegwu Ojukwu University (COOU) is a state-owned university located in Anambra State, Nigeria. It was established in 2000 as Anambra State University of Science and Technology (ASUTECH) through an Anambra State Law No. 13 of 2000 (COOU, 2022). The University was conceived a 2-Campus structure with the main campus of the University located at Uli in the former site of the Ekwenugo Okeke Polytechnic, formally called Anambra state Polytechnic and the second campus located at Igbariam in the former site of the College of Agriculture (COOU, 2022). In 2007, the university was renamed Chukwuemeka Odumegwu Ojukwu University in honour of the late Biafran leader, Dim Chukwuemeka Odumegwu Ojukwu.

## POPULATION OF THE STUDY

The population of the study comprised of 61,888 undergraduate students in the regular programme of Nnamdi Azikiwe University and Chukwuemeka Odumegwu Ojukwu University for the 2022/2023 academic session, according to the Office of the Registrar of both schools. This number comprised of 100 – 400 level students of the Department which was obtained through the course representative of each class. Further breakdown of this number shows that Nnamdi Azikiwe University has 34,376 students while Chukwuemeka Odumegwu Ojukwu University has 27, 512 students.

## SAMPLE AND SAMPLING TECHNIQUE

The sample size for this study was 300 undergraduate students of Nnamdi Azikiwe University and Chukwuemeka Odumegwu Ojukwu University. The study adopted multi-stage sampling technique. First, purposive sampling technique was used to select the Awka campus of Nnamdi Azikiwe University and Igbariam campus Chukwuemeka Odumegwu Ojukwu University. Simple random sampling technique was used to select three (3) Faculties from the sampled campuses. Accidental sampling technique was used to sample 150 students (50 students from each Faculty) from each of the sampled campuses, bringing the total to 300 respondents.

## INSTRUMENT FOR DATA COLLECTION

The instrument for data collection is a structured questionnaire titled “Perceived Effect of Artificial Intelligence Tools on the Academic Performance of Students in Public Universities in Anambra State Questionnaire (PEAITAPSPUASQ).” The instrument was developed in line with the research questions by the researchers. The instrument was divided into three clusters. The first cluster with a total of 8 items sought respondents’ opinion regarding the perceived effect of artificial intelligence (AI) tools on the learning abilities of students in public universities in Anambra State. The second cluster with a total of 7 items sought respondents’ opinion regarding perceived effect of artificial intelligence (AI) tools on the problem-solving skills of students in public universities in Anambra State. The third cluster with a total of 6 items sought respondents’ opinion regarding the perceived effect of artificial intelligence (AI) tools on the critical thinking of students in public universities in Anambra State. The instrument has a total of 21 item based on four-point Likert scale of Strongly Agree (SA), Agree (A) Disagree (D) and Strongly Disagree (SD).

## VALIDATION OF THE INSTRUMENT

To ascertain the validity of the questionnaire, two copies of the questionnaire alongside with the study title, purpose of the study, scope and research questions were given to two experts in Faculty of Education, Nnamdi Azikiwe University, Awka, for validation. The inputs made by the experts were used to make modifications in the instrument before the final production.

## RELIABILITY OF THE INSTRUMENT

To ascertain the reliability of the instrument, a trial test was carried out. The instrument was administered to 20 students of Federal Polytechnic, Oke. The data collected was tested using Cronbach Alpha coefficients. The overall reliability estimate expected for instrument was .82, showing that it was reliable for the study.

## METHOD OF DATA COLLECTION

The researcher administered copies of the questionnaires to the students in the sampled secondary schools for this study with the help of two research assistants who were friends of the researchers and were trained on what to do. The Direct Delivery Method (DDM) was used in order to enable the researcher collect back the instrument immediately.

## METHOD OF DATA ANALYSIS

The researcher made use of SPSS version 23 to analyze the data of the study. Inferential descriptive statistics of correlation analysis was used for the study. Three research questions were analyzed using Pearson product moment correlation (PPMC) statistical tools.

III. RESULTS

*Research Question One:* What is the relationship of artificial intelligence (AI) tools and the learning abilities of students in public universities in Anambra State?

Variable	Mean	Std. Dev.	N	R	P	Remark
Academic Performance	30.26	4.51	300	.503**	.000	Sig.
The Learning Abilities	29.37	3.22				

\*Sig. at .05 level

Table 1: Result of PPMC showing the significant relationship of artificial intelligence (AI) tools and the learning abilities of students

Table 1 above shows that there was a positive significant relationship of artificial intelligence (AI) tools and the learning abilities of students in public universities in Anambra State ( $r = .503$ ,  $N = 300$ ,  $p < .05$ ). The result shows that there was a positive significant relationship of artificial intelligence (AI) tools and the learning abilities of students in public universities in Anambra.

*Research Question Two:* What is the relationship of artificial intelligence (AI) tools on the problem-solving skills of students in public universities in Anambra State?

Variable	Mean	Std. Dev.	N	R	P	Remark
Academic Performance	30.26	4.51	300	.462**	.000	Sig.
The Problem Solving skills	29.28	4.37				

\*Sig. at .05 level

Table 2: Result of PPMC showing the significant relationship of artificial intelligence (AI) tools on the problem-solving skills of students in public universities

Table 2 above shows that there was a positive significant relationship of artificial intelligence (AI) tools on the problem-solving skills of students in public universities in Anambra State ( $r = .462$ \*\*,  $N = 300$ ,  $p < .05$ ). The result shows that there was a positive significant relationship of artificial intelligence (AI) tools on the problem-solving skills of students in public universities in Anambra State

*Research Question Three:* What is the relationship of artificial intelligence (AI) tools on the critical thinking abilities of students in public universities in Anambra State?

Variable	Mean	Std. Dev.	N	R	P	Remark
Academic Performance	30.26	4.51	300	.646**	.000	Sig.
The critical thinking abilities	28.62	4.18				

\*Sig. at .05 level

Table 3: Result of PPMC showing the significant relationship of artificial intelligence (AI) tools on the critical thinking abilities of students in public universities

Table 4.2 above shows that there was a positive significant relationship of artificial intelligence (AI) tools on the critical thinking abilities of students in public universities in Anambra State ( $r = .646$ \*\*,  $N = 300$ ,  $p < .05$ ). The result shows that there was a positive significant relationship of artificial intelligence (AI) tools on the critical thinking abilities of students in public universities in Anambra State

IV. DISCUSSION

The analysis of field data on the first research question which sought to examine the perceived effects intelligence (AI) tools on the learning abilities of students in public universities in Anambra State, revealed that artificial intelligence tools such as ChatGPT, Scikit Learn, TensorFlow, PyTorch, CNTK, Caffe, Apache MXNet, Keras, OpenNN, AutoML, H2O, OpenAI, Grammarly, and Quillbox, personalize students' learning experiences that meet their academic needs, improve my comprehension of topics in their course of study, improve students' ability to retain what they have been taught in class by their lecturers, provide immediate feedbacks that allows students to correct their mistakes in any course topic, improves students' understanding of concepts in courses, help students get access to education materials that improve their understanding of concepts, provide students with non-bias answers that improve their understanding of topic taught by their lecturers, and give accurate answers to students which improve their understanding of topic taught by their lecturers. This finding is in line with that of Hwang, Xie, Wah, & Gašević (2020) which states that the utilization of artificial intelligence tutoring systems has the potential to provide tailored guidance, support, and feedback to students based on their individual learning patterns and knowledge levels.

Furthermore, analysis of field data for the second question of this study which sought to examine the perceived effects intelligence (AI) tools on the problem-solving skills of students in public universities in Anambra State revealed that Artificial intelligence tools such as ChatGPT, Scikit Learn, TensorFlow, PyTorch, CNTK, Caffe, Apache MXNet, Keras, OpenNN, AutoML, H2O, OpenAI, Grammarly, and Quillbox, provide learning materials that help students develop effective problem-solving strategies in their courses, provide students with personalized guidance, which help me to improve my problem-solving skills over time, provide students with opportunities to apply their problem-solving skills in a safe digital environment, and help students answer assignments given to them by their lecturers. This finding corroborates with that of Jain and Jain (2019) which revealed that students can learn by the experimentation strategy without fear as AI bolsters in their learning and give help to their improvement. The authors also revealed that Artificial Intelligence (AI) creates an encouraging environment, especially, can provide a favourable context for students learning characteristics and process.

Finally, the analysis of field data for the third question of this study revealed that Artificial intelligence tools such as ChatGPT, Scikit Learn, TensorFlow, PyTorch, CNTK, Caffe, Apache MXNet, Keras, OpenNN, AutoML, H2O, OpenAI, Grammarly, and Quillbox provide students with access to vast amounts of information and data for their studies, do not limit students' ability to think creatively in my course, makes students think critically about results it gives them, and does not prevent students from having an independent thinking about concepts in their course. This finding is in line with that of Tuomi (2018) which state that AI may thus provide exciting new opportunities for adapting learning content based on student's individual characteristics, and can speed-up cognitive development and create cognitive capabilities that would not be possible without technology.

## V. CONCLUSION

Based on the findings of the study, it is therefore concluded that Artificial intelligence (AI) tools have positive effect on the learning abilities, problem-solving skills, and critical thinking abilities of students in public universities in Anambra State.

## RECOMMENDATIONS

Based on the findings of this study, the following recommendations were made:

- ✓ Students are advised to embrace Artificial Intelligence (AI) tools, seek courses that integrate them, and stay updated with developments in AI.
- ✓ Lecturers should integrate Artificial Intelligence (AI) tools, receive training, and explore ways to use them for developing students' skills.
- ✓ University management is recommended to invest in Artificial Intelligence (AI), prioritize training and provide support for departments and lecturers who use AI tools innovatively.

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