

PERCEIVED INFLUENCE OF ARTIFICIAL INTELLIGENCE IN LEARNING COMPUTER PROGRAMMING AMONG COMPUTER EDUCATION STUDENTS IN PUBLIC UNIVERSITIES IN ENUGU STATE

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Abstract

This study examined the perceived influence of ChatGPT on learning computer programming among Computer Education students in public universities in Enugu state. The study was guided by three research questions and three null hypotheses. A descriptive survey research design was adopted for the study. The population comprised 950 Computer Education students from public universities in Enugu State, offering Computer Education programs. A multistage sampling technique was used for the study. purposive sampling was employed to select public Universities offering Computer Education programs. Thereafter, proportionate stratified sampling technique was used to allocate respondents according to institution and level of study. The population was stratified into two strata: 200-level students from UNN and 200-level students of ESUT. Using proportionate allocation, 167 respondents were selected from UNN and 114 respondents were selected from ESUT, resulting to sample size of 281 respondents. Data were collected using a researcher-developed questionnaire titled Perceived Influence of ChatGPT on Learning Computer Programming Questionnaire (PICLPQ). The instrument was validated by three experts and its reliability was established using Cronbach's alpha which yielded 0.87 coefficient. Mean and standard deviation were used to answer the research questions, while t-test statistics were used to test the hypotheses at 0.05 level of significance. findings revealed that ChatGPT positively influenced students' conceptual understanding of concepts, skill development, independent learning, and also found that over depending on Chat GPT may reduce programming skills. The study concluded that ChatGPT is a valuable learning tool for programming and recommended its responsible integration into Computer Education programs.

Keywords: Learning, Computer Programming, Computer Education, Artificial intelligence, (chat GPT) and Students.

Introduction

Learning is a fundamental process through which individuals acquire knowledge, skills, values, and competencies that enable them to adapt to their environment and perform tasks effectively. According to Herpratiwi & Tohir, (2022), it is generally regarded as a relatively permanent change in knowledge, skills, attitudes, or behavior resulting from experience, practice, observation, or instruction. In public university settings, learning is considered a critical factor of students' academic success. According to Ibok et al. (2024), learning facilitates

the acquisition of knowledge and the development of competencies necessary for achieving educational objectives. Effective learning occurs when learners actively engage with instructional content, construct meaning from experiences, and apply acquired knowledge to solve problems in diverse contexts (Ebbini, 2023). Learning extends beyond the acquisition of theoretical knowledge to include the development of practical skills, critical thinking abilities, and problem-solving competencies. This is particularly important in Computer Education, where students are expected to acquire both conceptual knowledge and practical skills required for computer programming and related tasks.

Conceptual knowledge refers to a learning approach that focuses on understanding the underlying principles, ideas, relationships, and meaning behind a subject matter rather than merely memorizing facts or procedures. It enables the learner to connect new knowledge with existing knowledge and apply what they have learned to different situation and problems. Among the various courses offered in Computer Education programs, computer programming is one of the most fundamental and challenging areas of study (Paiva., Leal., & Figueira, 2022). Computer programming involves the design, development, testing, and maintenance of computer programs through the use of programming languages to solve specific problems. It requires students to understand concepts such as algorithms, program logic, syntax, debugging, control structures, and computational thinking (Gagniuc, 2023). Hence, learning computer programming seems very challenging to students.

Students who fail to understand fundamental programming concepts may encounter difficulties in writing programs, debugging code, and solving computational problems effectively. According to Ichsan et al., (2023), conceptual understanding is a significant predictor of students' success in programming because it enables them to apply programming principles rather than merely memorize syntax. Consequently, educators and researchers continue to seek innovative instructional approaches that can facilitate students' learning of programming concepts and improve learning outcomes.

In Universities, particularly within Computer Education programs, there is an increasing demand for innovative instructional strategies that can equip students with relevant digital and programming skills required in the modern knowledge environment. Computer programming is the process of designing and implementing instructions that a computer can execute to perform specific tasks (Wengner & Souza, 2023). These instructions are also known as codes. Computer Programming enables programmers to create software applications, websites, and systems that automate processes and solve real-world problems. One of the most widely used programming paradigms is Object-Oriented Programming (OOP).

OOP is a programming paradigm that structures software development that showcases Objects and Classes. Object are instances of classes while a class defines the blueprint for creating objects, attributes and methods into a single unit (Moraiti., Fotoglou., & Drigas. 2022). OOP is a way of designing and organizing codes that stimulates real-world Objects and systems. Common OOP languages includes: Java, C++, C#, Ruby and Python. Each of these Computer programming languages has a unique set of keyword or special keys and syntax for organizing the instructions of the program. Many students encounter difficulties in understanding programming concepts due to their abstract nature and the limitations associated with traditional lecture-based teaching methods (Zawacki-Richter et al., 2022). This is in line with Cheah, (2020) and Kučak, et al. (2022) who noted that Computer programming is often considered the most challenging subject to learn and research has identified three main categories contributing to these difficulties including the nature of programming itself, student-related factors, and teaching-related challenges.

Judging programming difficulty by the Nature of Programming, Computer Programming is all about thinking logically, solving problems, and seeing things in a more abstract or creative way. Students must understand complex concepts such as algorithms, data structures, and syntax rules. These abstract ideas may be difficult to understand, especially for beginners. Additionally, the immediate and challenging feedback from compilers or interpreters can be discouraging, as even a minute error can prevent a program from running correctly (Yusoff et al., 2020). Students' backgrounds, attitudes, and learning strategies heavily affect the learning of computer programming. Lack of prior logical reasoning or problem-solving experience also hampers progress. Motivation and self-reliance likewise affect success; perceived difficulty and repeated failures without support reduce students' engagement in programming. Teaching programming is equally challenging, due to large class sizes, limited resources, and different skill levels complicate instruction. The traditional teaching methods may not sufficiently support learning when based on the trial-and-error process, causing more confusion to learners (Kadar et al., 2021). Students face difficulty in understanding basic programming concepts, designing programs, and mastering syntax. Practical and intensive training is crucial (Ichsan et al., 2023).

Effective programming teaching requires subject mastery and skill in simplifying complex concepts. Some lecturers employ conventional approaches focused on concept explanation but neglect real-life application (Mohamad et al., 2022). In teaching computer programming, focusing on programming basics combined with real-world contexts improves comprehension and interest, which enhances effective learning. In providing supplementary

learning resources and alternative explanations of concepts, Artificial Intelligence (such as Chat GPT) has helped students to better comprehend the learning material, leading to improved performance on assignments, projects, and examinations. Hence, Wang and Huang (2025) noted that Artificial Intelligence (AI) has emerged as a transformative tool capable of improving instructional delivery and enhancing students' learning experiences.

Artificial Intelligence (AI) refers to the capability of computer systems and digital technologies to simulate human intelligence in performing tasks such as learning, reasoning, decision-making, language processing, and problem-solving. AI involves the development of systems that can analyze information, identify patterns, and generate responses that resemble human cognitive functions. Over the years, AI has evolved into a transformative technology affecting sectors such as medicine, finance, agriculture, manufacturing, and education (Grassini, 2023). In education, AI supports teaching and learning through intelligent tutoring systems, adaptive learning environments, automated assessment, personalized instruction, and instant feedback mechanisms. The integration of AI into educational practice has contributed to improved accessibility, learner engagement, and individualized learning experiences. AI-powered systems help learners' study according to their pace, learning preferences, and instructional needs (Lo, 2023).

Artificial Intelligence is commonly classified into narrow AI and general AI. Narrow AI focuses on performing specific tasks such as speech recognition, recommendation systems, chatbots, and automated language processing, whereas general AI refers to systems capable of broader human-like intelligence across multiple domains. ChatGPT as a generative AI is an accessible conversational platform capable of answering questions, summarizing information, generating written content, writing code, explaining concepts, and supporting problem-solving. Unlike conventional search engines that primarily retrieve information, ChatGPT produces context-based responses and interactive explanations tailored to user prompts (Grassini, 2023). Zheng (2023) noted that ChatGPT can assist learners in understanding concepts, generating code, solving programming tasks, and supporting data science learning activities. According to Grassini (2023), ChatGPT possesses significant potential for transforming educational practice through personalized learning, automated support, learner engagement, and accessible academic assistance. ChatGPT is becoming more integrated into education. This shows its importance in technology-focused fields such as Computer Education (Chan & Hu 2023). ChatGPT has attracted significant attention because of its potential to transform learning processes. Lo (2023) noted that ChatGPT can function as a virtual tutor, instructional assistant and collaborative learning tool. Students, especially in public universities in Enugu State,

would increasingly employ the tool for computer programming, brainstorming, tutoring, coding support, research assistance, and collaborative learning activities.

A student is defined as a learner who engages in educational activities and the process of learning within an academic institution (Ferrer et al., 2022). This involves various activities aimed at acquiring knowledge, skills, and competencies that are facilitated by educational institutions such as schools, colleges, and universities. Also, Gopinathan et al. (2022) defined a student as an individual who actively participates in educational activities within an academic institution. This participation includes attending classes, completing assignments, and engaging in various learning opportunities. A student is someone who is formally enrolled in an educational institution and engages in activities that promote learning and personal development. Students actively participate in learning activities, including attending lectures, participating in discussions, completing assignments, and conducting research. This engagement is crucial for their academic and personal development. According to Forman., Udvaros & Avornicului (2023), many students regardless of their gender make use of Chat GPT to actively participate in all activities that surround learning. Gender according to Anih and Ukeh (2022) is defined as a socially constructed characteristics, role and responsibilities of male and female. A study conducted by Anih and Ukeh revealed that male students make more use of technology in learning than female students. Ascertaining the perception of students in the use ChatGPT is vital in determining the effectiveness of Gen-AI in their learning.

Students' perceptions refer to the attitudes, beliefs, and opinions students hold toward a particular instructional method or learning technology. According to Bansah & Darko-Agyei (2022), students' perception is an important factor that influences the acceptance and effectiveness of new learning systems. Positive perceptions may increase students' motivation, engagement, and willingness to interact with learning materials, and vice versa. Bansah & Darko-Agyei, further stated that when students perceive a learning tool as useful and easy to use, they are more likely to adopt these technologies and actively participate in the learning process. In the context of this study, the perceived influence of ChatGPT refers to students' opinions, judgments, and beliefs regarding how the tool affects their learning experiences and academic performance. Previous studies show that students often utilize AI (Chat GPT) tools to supplement traditional teaching methods. According to Romero-Rodríguez et al. (2023), noted that university students perceived ChatGPT as a useful learning companion that enhanced understanding, support critical thinking, and improved learning experiences. Similarly, Zheng (2023) reported that students who utilized ChatGPT during programming

activities experienced improved conceptual understanding and greater confidence in solving coding problems. Also, Montenegro-Rueda et al. (2023) concluded that ChatGPT is widely utilized by students to promote personalized learning, independent study, and academic engagement across higher education.

Student utilization of ChatGPT refers to the frequency and manner in which learners employ the tool to support studying, researching, assignment completion, problem-solving, concept clarification, and skill development. Despite the increasing utilization of ChatGPT by students for academic purposes, concerns remain regarding its actual influence on learning outcomes and academic achievement. While some studies have reported that ChatGPT enhances understanding, problem-solving skills, and academic performance through personalized learning support and instant feedback (Lo, 2023; Romero-Rodríguez et al., 2023), other scholars have expressed concerns about excessive dependence on the tool, reduced critical thinking, inaccurate responses, and academic dishonesty (Grassini, 2023; Chan & Hu, 2023). These divergent views have generated debates among educators and researchers regarding whether the utilization of ChatGPT genuinely improves students' learning or merely provides short-term academic assistance.

The concern becomes more significant in computer programming, a course that requires students to develop logical reasoning, problem-solving abilities, computational thinking, and practical coding skills. Although ChatGPT can assist students in generating code, debugging programs, and explaining programming concepts, excessive reliance on the tool may limit opportunities for independent learning and skill development. Consequently, there is uncertainty regarding the extent to which students' utilization of ChatGPT influences learning in computer programming. Observations suggest that many Computer Education students utilize ChatGPT for programming assignments, coding exercises, and examination preparation. However, empirical evidence on the perceived influence of ChatGPT on the learning of computer programming is limited. It is therefore unclear whether the utilization of ChatGPT contributes positively to students' achievement in computer programming or whether it presents challenges that may undermine meaningful learning. This gap in knowledge necessitated the present study on the perceived influence of ChatGPT on learning Computer Programming among Computer Education students in public Universities in Enugu State.

Purpose of the Study

The main purpose of the study is to investigate the perceived influence of ChatGPT in learning computer programming among Computer Education students in public universities in Enugu State. Specifically, the study sought to determine the:

1. The perceived influence of ChatGPT on Computer Education students' understanding of programming concepts.
2. The perceived influence of ChatGPT on Computer Education students' programming skills.
3. The perceived challenges of ChatGPT in the learning of computer programming among Computer Education in public Universities in Enugu State.

Research Questions

1. What is the perceived influence of ChatGPT on Computer Education students' understanding of programming concepts in public universities in Enugu State?
2. What is the perceived influence of ChatGPT on Computer Education students' coding and problem-solving skills in public universities in Enugu State?
3. What are the perceived challenges associated with the use of ChatGPT in the learning of computer programming in public universities in Enugu State?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance.

- H₀₁: There is no significant difference in the mean ratings of male and female students on the perceived influence of ChatGPT on understanding programming concepts in public Universities in Enugu State.
- H₀₂: There is no significant difference in the mean ratings of male and female students on the perceived influence of ChatGPT on coding and problem-solving skills in public Universities in Enugu State.
- H₀₃: There is no significant difference in the mean ratings of male and female students on the perceived challenges of ChatGPT on the learning of computer programming in public Universities in Enugu State.

Methodology

This study adopted a descriptive survey research design. According to Osunbor & Oforbruku (2023), descriptive research design is a process of collecting data in a research procedure employed to elicit information from a population sample through direct solicitation. The descriptive survey design is considered appropriate because it enables the researcher to collect data from respondents to determine their perceptions, opinions, attitudes, and experiences regarding a phenomenon under investigation. The design is suitable for this study because it seeks to determine the perceived influence of ChatGPT in learning computer programming among Computer Education students in public universities in Enugu State. The

area of the study, Enugu state, has two public Universities, University of Nigeria Nsukka (UNN) and Enugu State University of Science and Technology (ESUTH), offering Computer Education programmes. Enugu State is located in the South-East geopolitical zone of Nigeria and is recognized for its expanding educational sector and increasing adoption of digital technologies in teaching and learning.

The population of this study comprises all 950 Computer Education students in public universities in Enugu State. UNN comprises 550 students while ESUTH comprises 400 students. The population includes undergraduate students enrolled in Computer Education programs across the public universities within the state. These students constitute the target respondents because they are directly involved in computer programming courses and are likely to have exposure to digital learning technologies such as ChatGPT. A multistage sampling technique was used for the study. First, purposive sampling was employed to select public Universities in Enugu State offering Computer Education programs. Thereafter, the proportionate stratified sampling technique was used to allocate respondents according to institution and level of study. The population was stratified into two strata: 200-level Computer Education students from the University of Nigeria, Nsukka (UNN) and 200-level Computer Education students of Enugu State University of Science and Technology (ESUT). Using proportionate allocation, 167 respondents were selected from UNN, and 114 respondents were selected from ESUT, giving a total sample size of 281 respondents.

The instrument for data collection was a structured questionnaire titled “Perceived Influence of ChatGPT in learning computer programming Questionnaire (PICLCPQ)” developed by the researchers. The questionnaire consists of two sections: Section A deals with demographic information of the respondents, such as gender, institution, and level of study. Section B has 18 items, which were further divided into three parts. Part 1 consists of 6 items measuring students’ perceptions regarding the influence of ChatGPT on understanding the concepts of programming, Part 2 contains 6 items measuring students’ perceptions regarding the influence of ChatGPT on coding skills, and Part 3 contains 6 items measuring students’ perceptions regarding the perceived challenges of ChatGPT in the leaning of computer programming among Computer Education students in public Universities in Enugu State. The response options were structured using a five-point Likert scale ranging from strongly disagree (SD) = 1 to Strongly Agree (SA) = 5. The instrument was subjected to face and content validation by three experts: two experts in Computer Education and one expert in Measurement and Evaluation. The validators were asked to examine the instrument for clarity, relevance, appropriateness, and adequacy of the questionnaire items in relation to the objectives, research

questions, and hypotheses of the study. Their observations and recommendations were incorporated into the final version of the instrument.

The reliability of the instrument was established through a pilot test involving respondents outside the study area but possessing similar characteristics to the study population. The internal consistency of the instrument was determined using the Cronbach's Alpha reliability method, which yielded a coefficient of 0.87. The researcher administered the questionnaire directly to the respondents with the help of three trained research assistants. The respondents were given adequate time to complete the questionnaire, after which completed copies were retrieved for analysis. The data collected were analyzed using both descriptive and inferential statistics. Research questions were answered using mean and standard deviation. The decision rule for interpretation of the mean scores was based on the criterion mean of 2.50. Any item with a mean score of 2.50 and above was agreed, while items with mean scores below 2.50 were disagreed. The hypotheses were tested using t-test statistics at 0.05 level of significance. The analysis was carried out using the Statistical Package for Social Sciences (SPSS, version 27).

Results

The results of the study were presented according to the research questions as follows:

Research Question 1: What is the perceived influence of ChatGPT on Computer Education students' understanding of programming concepts in public universities in Enugu State?

Table 1: Mean ratings of computer education students on understanding of programming concepts in public universities in Enugu State

S/N	Item	Mean	SD	Decision
1	ChatGPT facilitates my understanding of difficult programming concepts.	4.18	0.79	Agree
2	ChatGPT improves my comprehension of programming syntax.	4.05	0.84	Agree
3	ChatGPT enhances my understanding of programming algorithms.	4.11	0.82	Agree
4	ChatGPT helps me understand program logic more effectively.	4.08	0.87	Agree
5	ChatGPT supports independent learning of programming concepts.	4.32	0.75	Strongly Agree
6	ChatGPT provides explanations that improve my conceptual understanding of programming topics.	4.16	0.81	Agree
	Grand Mean	4.15	0.81	Agree

The findings in Table 1 indicate that respondents generally agreed that ChatGPT positively influences learning support in understanding the concept of computer programming. Respondents strongly agreed that ChatGPT supports independent learning of programming concepts ($M = 4.32$, $SD = 0.75$). Also, the table reveals that the Standard Deviation of the items are within the range of 0.75 to 0.87, these are less than 1.96, which is 95% confidence limit. This indicates that there is a close range to their responses and that their responses were not far from the mean.

Research Question 2: What is the perceived influence of ChatGPT on Computer Education students' coding and problem-solving skills in public universities in Enugu State?

Table 2: Mean ratings of computer education students' coding and problem-solving skills in public universities in Enugu State

S/N	ITEMS	MEAN	SD	DECISION
7	ChatGPT improves my ability to write programming code.	4.20	0.77	Agree
8	ChatGPT enhances my debugging skills during programming tasks.	4.09	0.86	Agree
9	ChatGPT strengthens my programming problem-solving ability.	4.14	0.80	Agree
10	ChatGPT improves my computational thinking skills.	4.02	0.88	Agree
11	ChatGPT supports my ability to develop solutions to programming problems.	4.29	0.72	Strongly Agree
12	ChatGPT assists me in completing programming assignments accurately.	4.07	0.83	Agree
	Grand mean	4.14	0.81	Agree

The results show that respondents agreed that ChatGPT contributes positively to programming skill development. Respondents strongly agreed that ChatGPT supports their ability to develop solutions to programming problems ($M = 4.29$, $SD = 0.72$). The findings in Table 2 indicate that respondents generally agreed that ChatGPT positively influences learning support in computer programming. Also, the table reveals that the Standard Deviation of the items are within the range of 0.72 to 0.88, these are less than 1.96, which is 95% confidence limit. This indicates that there is a close range to their responses and that their responses were not far from the mean.

Research Question 3: What are the perceived challenges associated with the use of ChatGPT in computer programming in public Universities in Enugu State?

Table 3: Mean ratings of computer education students' coding and problem-solving skills in public universities in Enugu State

S/N	ITEMS	MEAN	SD	DECISION
13	Depending on ChatGPT may weaken students' independent on programming ability.	4.08	0.83	Agree
14	ChatGPT occasionally provides inaccurate programming responses.	3.96	0.86	Agree
15	Using ChatGPT may reduce critical thinking during programming tasks.	2.49	1.09	Disagree
16	Excessive use of ChatGPT may discourage independent problem-solving in programming	4.03	0.84	Agree
17	Technical limitations can hinder effective use of ChatGPT for programming learning.	3.56	0.85	Agree
18	Concerns about academic dishonesty may affect the educational use of chatGPT	4.31	0.76	Strongly Agreed
	Grand mean	3.96	0.84	Agree

The results reveal that respondents generally agreed that there are challenges associated with the use of ChatGPT in learning computer programming. Students strongly agreed that concerns about academic dishonesty may affect the educational use of ChatGPT ($M = 4.31$, $SD = 0.74$). However, they disagree on whether ChatGPT reduces critical thinking during programming tasks ($M = 2.49$, $SD = 1.09$). The grand mean of 3.96 indicates that students acknowledge the existence of certain challenges associated with the use of ChatGPT. The standard deviation ranges from 0.74 to 1.09. This indicates that that their responses were not far from the mean.

H₀: There is no significant difference in the mean ratings of male and female students on the perceived influence of ChatGPT on understanding programming concepts in public Universities in Enugu State.

Table 4: Sample T-test of male and female students on the perceived influence of ChatGPT on understanding programming concepts.

Gender of the respondents		$\bar{X}$	SD	DF	T	P	DECISION
CLUSTER 1	Female	3.35	0.25				
	Male	3.29	0.35	168.79	1.29	0.199	Not sig
<i>X = mean, SD = standard deviation, DF = degree of freedom, P = sig value</i>							

Table 4 above shows the independent sample T-test conducted to compare the mean ratings of male and female students on the perceived influence of ChatGPT on understanding

programming concepts in public Universities in Enugu State. The result revealed no statistically significant difference in understanding programming concepts between male students with the Mean ratings of 3.29 and std deviation of 0.25 and female students (mean 3.29, SD = 0.35), $t(168.79) = 1.29$, $p = 199$, the null hypothesis is not rejected.

H02: There is no significant difference in the mean ratings of male and female students on the perceived influence of ChatGPT on coding and problem-solving skills in public Universities in Enugu State.

Table 5: Sample T Test of male and female students on problem-solving skills

	Gender	$\bar{X}$	SD	DF	T	P	DECISION
CLUSTER 1	Male	4.19	0.23				
	Female	4.15	0.18	198	-3.804	0.217	Not Sig

$\bar{X}$ = mean, SD = standard deviation DF = degree of freedom, P = sig Value

From table 5 above, the result indicates that there is no significant difference on coding and problem solving skills of male and female students ($t(198) = -3.80$, $P = 0.217$). Although male students had a slightly higher mean score ($M=4.19$) than female ($M=4.15$), the difference was not significant, therefore the null hypothesis is not rejected.

H03: There is no significant difference in the mean ratings of male and female students on the perceived challenges of ChatGPT on the learning of computer programming in public Universities in Enugu State.

Table 6: Sample T Test of male and female students on Challenges associated with chatGPT in learning computer programming in public Universities

	Gender	$\bar{X}$	SD	DF	T	P	DECISION
CLUSTER	Male	4.11	0.34	198	-0.03	0.557	
	Female	4.14	0.37				Not sig

$\bar{X}$ = mean, SD = standard deviation DF = degree of freedom, P = sig Value

From table 6 above, the independent sample t-test result indicates that there is no significant difference of male and female students in learning computer programing. ($t(198) = -0.59$, $P =$

0,557). Male student had mean score ($M=4.11$, $SD = 0.34$) and female ($M=4.14$, $SD = 0.37$), this suggest that student perception did not differ based on their gender, therefore the null hypothesis is not rejected

Discussion of Results

The findings of the study revealed that computer education students agreed that ChatGPT positively influences learning in computer programming. The students indicated that ChatGPT helps in understanding of difficult programming concepts, improves comprehension of programming syntax, enhances understanding of algorithms and program logic, and supports independent learning of programming concepts. The findings also reveal that there no significant difference between the male and female students. This finding suggests that ChatGPT serves as an effective educational tool for promoting conceptual understanding in computer programming. The finding is consistent with the study of Lo (2023) who reported that ChatGPT functions effectively as a virtual tutor and instructional assistant capable of supporting students' learning experiences through explanations, feedback, and concept clarification. Similarly, the study agrees with Montenegro-Rueda et al. (2023) who found that ChatGPT contributes to individualized learning, tutoring, and educational assistance across academic disciplines.

Findings also reveal students indicated that ChatGPT improves coding ability, debugging competence, programming problem-solving skills, computational thinking, and the development of solutions to programming problems. The finding implies that ChatGPT may provide students with useful programming support through code generation, error identification, debugging assistance, and algorithm explanation. Such support may contribute to improved competence and confidence in programming tasks. the finding agrees with the study of Zheng (2023) which reported that ChatGPT supports coding activities, problem-solving processes, and concept explanation in programming and data science education. The finding also aligns with Lo (2023) who found that ChatGPT demonstrates satisfactory performance in coding-related educational tasks and can assist learners in solving programming problems.

The findings revealed that students generally agreed there are some challenges associated with the use of ChatGPT in learning computer programming. Students agreed that dependence on ChatGPT may weaken independent programming ability, that ChatGPT may occasionally provide inaccurate responses, and that technical limitations may hinder its effective use. Respondents also strongly agreed that concerns regarding academic dishonesty

may affect the educational use of ChatGPT. However, respondents disagreed about whether ChatGPT reduces critical thinking during programming tasks. The finding implies that although students recognize the educational benefits of ChatGPT, they also acknowledge concerns relating to dependence, response accuracy, ethical issues, and technological barriers. This suggests the need for responsible integration and guided use of ChatGPT within educational environments. The finding agrees with Grassini (2023) who identified concerns relating to misinformation, overdependence, transparency, and academic integrity in the educational use of ChatGPT. Similarly, Chan and Hu (2023) found that students expressed concerns regarding ethical issues, academic misconduct, and overreliance on generative AI tools. The finding also aligns with Montenegro-Rueda et al. (2023) who reported that reliability concerns, ethical issues, and academic dishonesty constitute significant challenges associated with ChatGPT implementation in education.

Conclusion and Implications of the Study

In conclusion, the results of the study are very important because they show us a lot of things about teaching and learning computer programming in public universities. The study shows that learning with AI improve learning and help students to better understand the programming concepts and improves their performance in the programming classes. Students' positive attitudes toward learning with AI can show that they are ready to be taught in an AI-enhanced learning environment. This has many implications.

For Computer Education lecturers, the findings highlight the need to integrate AI-powered learning tools into instructional delivery. Such integration can complement traditional teaching methods, improve student engagement, and promote more effective learning experiences. This calls for Computer Education teachers to incorporate AI-enhanced tools in their lessons in order to complement traditional teaching approaches to increase student engagement and improve learning experiences.

Public Universities should use AI learning tools encourage self-learning and improve student academic performance in order to pursue related professions involving AI technologies. The integration of these technologies will also assist in modernizing teaching approaches according to recent technological developments.

Curriculum planners need to create curricula that incorporates AI-enhanced approaches in some subjects, especially the introduction of computer programming and digitization to equip students with relevant technological skills in the era of digitalization.

Recommendations

Based on the findings and implications of the study, the following recommendations were made;

1. Lecturers and instructors at the Public Universities should adopt the use of AI learning tools such as ChatGPT in the instructional delivery of Computer Programming to enhance learning.
2. The National Universities Commission (NUC) should incorporate the use of AI learning tools in the teaching and learning of Computer Programming in their next review of Computer Education Curriculum especially in Computer Programming.
3. Seminars, workshop and training should be organized by NUC in collaborations with the ministry of Education where Computer teachers, institutions and administrators will be taught on how to make use AI learning tools in instructional delivery for optimal purpose.
4. The government should provide adequate facilities that will enable the lecturers and students to make use of technological gadget in teaching and learning of Computer Programming.

References

- Anih, A.A. & Ukeh, B. O (2022). Effect of zoom technology on senior secondary students' academic achievement in word processing in ogbia local government area of Bayelsa. *Journal of association of vocational and the technical education of nigeria*.28(22), 230 - 239.
- Bansah, A. K., & Darko Agyei, D. (2022). Perceived convenience, usefulness, effectiveness and user acceptance of information technology: evaluating students' experiences of a Learning Management System. *Technology, Pedagogy and Education*, 31(4), 431-449.
- Bhadmus, J., Chidozie, F., & Osimen, G. U. (2024). A Survey on The Socio-Political Challenges Driving the Trend of Education Tourism in Foreign Institutions Among Nigerian Tertiary Level Students. *Educational Administration: Theory and Practice*, 30(5), 7595-7605.
- Chan, C. K. Y., & Hu, W. (2023). Students' voices on generative AI: Perceptions, benefits, and challenges in higher education. *International Journal of Educational Technology in Higher Education*, 20(43).
- Cook, H., Apps, T., Beckman, K., & Bennett, S. (2023). Digital competence for emergency remote teaching in higher education: Understanding the present and anticipating the future. *Educational technology research and development*, 71(1), 7-32. <https://doi.org/10.1007/s11423-023-10194-4>
- Ebbini, E. (2023). Enhancing Collaborative and Self-Paced Learning in Traditional and Distance Education Settings. In *Higher Education in the Arab World: E-Learning and Distance Education* (pp. 223-245). Cham: Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-33568-6_12

- Ferrer, J., Ringer, A., Saville, K., A Parris, M., & Kashi, K. (2022). Students' motivation and engagement in higher education: The importance of attitude to online learning. *Higher Education*, 83(2), 317-338. <https://doi.org/10.1007/s10734-020-00657-5>
- Forman, N., Udvaros, J., & Avornicului, M. S. (2023). ChatGPT: A new study tool shaping the future for high school students. *Future*, 5(6), 7.
- Gagniuc, P. A. (2023). *An Introduction to Programming Languages: Simultaneous Learning in Multiple Coding Environments*. Springer Nature.
- Gopinathan, S., Kaur, A. H., Veeraya, S., & Raman, M. (2022). The role of digital collaboration in student engagement towards enhancing student participation during COVID-19. *Sustainability*, 14(11), 6844. <https://doi.org/10.3390/su14116844>
- Grassini, S. (2023). Shaping the future of education: Exploring the potential and consequences of AI and ChatGPT in educational settings. *Education Sciences*, 13(7), 692.
- Herpratiwi & Tohir, A. (2022). Learning interest and discipline on learning motivation. *International Journal of Education in Mathematics, Science, and Technology (IJEMST)*, 10(2), 424-435. <https://doi.org/10.46328/ijemst.2290>
- Ibok, E. E., Ogbebe, O. R., Alu, O. P., Joseph, O. E., Udobong, D. M., & Collins, E. P. (2024). Teachers professional competencies as determinants of students' academic achievements in mathematics in Uyo Education zone of Akwa Ibom State, Nigeria. *Global Journal of Educational Research*, 23(1), 67 - 76
- Ichsan, I., Subroto, D., Dewi, R., Ulimaz, A., & Arief, I. (2023). The Effect of Student Worksheet with Creative Problem Solving Based On Students Problem Solving Ability. *Journal on Education*, 5(4), 11583-11591. <https://doi.org/10.31004/joe.v5i4.2108>
- Javornik, Š., & Klemenčič Mirazchiyski, E. (2023). Factors Contributing to School Effectiveness: A Systematic Literature Review. *European Journal of Investigation in Health, Psychology and Education*, 13(10), 2095-2111.
- Khan, A. A., & Sanosi, A. B. (2024). Correlation of ESP Learners' Cognitive, Metacognitive Strategies and Academic Achievement. *Journal of Language Teaching and Research*, 15(5), 1625-1633. <https://doi.org/10.17507/jltr.1505.23>
- Könings, K. D., Mordang, S., Smeenk, F., Stassen, L., & Ramani, S. (2021). Learner involvement in the co-creation of teaching and learning: AMEE Guide No. 138. *Medical teacher*, 43(8), 924-936.
- Kučak, D., & Kučak, M. (2022, May). Gamification in computer programming education—systematic literature review. In 2022 45th jubilee international convention on information, communication and electronic technology (mipro) 517-520. IEEE.
- Lo, C. K. (2023). What is the impact of ChatGPT on education? A rapid review of the literature. *Education Sciences*, 13(4), 410.
- Maxim, B. R., Galster, M., Mistrik, I., & Tekinerdogan, B. (2021). Data-intensive systems, knowledge management, and software engineering. In *Knowledge Management in the Development of Data-Intensive Systems* (pp. 1-40). Auerbach Publications.
- Montenegro-Rueda, M., Fernández-Cerero, J., Fernández-Batanero, J. M., & López-Meneses, E. (2023). Impact of the implementation of ChatGPT in education: A systematic review. *Computers*, 12(8), 153. <https://doi.org/10.3390/computers12080153>
- Moraiti, I., Fotoglou, A., & Drigas, A. (2022). Coding with Block Programming Languages in Educational Robotics and Mobiles, Improve Problem Solving, Creativity & Critical Thinking Skills. *International Journal of Interactive Mobile Technologies*, 16(20).
- Nouara, M., & Dehbia, M. (2023). *Students' Attitudes towards and Teachers' Perceptions of the Utilization of ChatGPT to Improve Students' Writing Proficiency* (Doctoral dissertation, Mouloud Mammeri University).

- Oginni, A.M., Saibu, S.O., Awobodu, V.Y., & Olude, A.S. (2024). Exploring the effectiveness of two tiers system of instruction on students' academic performance in basic science. *International Journal of Research and Scientific Innovation*, 10(12), 350-358.
- Osunbor, I., & Ofobruku, S.A (2023). Perception of research design for qualitative and quantitative studies. *West African social and Management science Review*, 9(1), 74-84.
- Paiva, J. C., Leal, J. P., & Figueira, Á. (2022). Automated assessment in computer science education: A state-of-the-art review. *ACM Transactions on Computing Education (TOCE)*, 22(3), 1-40.
- Romero-Rodríguez, J. M., Ramírez-Montoya, M. S., Buenestado-Fernández, M., & Lara-Lara, F. (2023). Use of ChatGPT at university as a tool for complex thinking: Students' perceived usefulness. *Journal of New Approaches in Educational Research*, 12(2), 323–339. <https://doi.org/10.7821/naer.2023.7.1458>
- Starko, A. J. (2021). *Creativity in the classroom: Schools of curious delight*. Routledge. <https://doi.org/10.4324/9781003105640>
- Wang, D., & Huang, X. (2025). Transforming education through artificial intelligence and immersive technologies: enhancing learning experiences. *Interactive Learning Environments*, 33(7), 4546-4565.
- Weissenbacher, B., Koschmieder, C., Krammer, G., Müller, F. H., & Neubauer, A. C. (2024). What makes future teachers successful? A longitudinal study on pre-service teachers. *European Journal of Teacher Education*, 1-20. <https://doi.org/pdf/10.1080/02619768.2024.2414200>
- Wengner, M., & Souza, B. (2023). *Practical Design Patterns for Java Developers: Hone your software design skills by implementing popular design patterns in Java*. Packt Publishing Ltd. <https://books.google.com.ng>
- Yusoff, K. M., Ashaari, N. S., Wook, T. S. M., & Ali, N. M. (2020). Analysis on the requirement of computational thinking skills to overcome the difficulties in learning programming. *International Journal of Advanced Computer Science and application*, 11(3), 244 – 252 <https://www.ijacsa.thesai.org>
- Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education. *International Journal of Educational Technology in Higher Education*, 16(1), 1–27. <https://doi.org/10.1186/s41239-019-0171-70>
- Zheng, Y. (2023). ChatGPT for teaching and learning: An experience from data science education.