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COMPUTER LITERACY AND ACADEMIC PERFORMANCE OF SCIENCE STUDENTS IN NIGERIA: ASSESSING THE ACHIEVEMENT GAP

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Abstract

The study investigated the level of computer literacy among science students and the perceived influence of computer literacy on their academic performance in Anambra State, Nigeria. Four research questions guided this study. A descriptive survey research design was adopted for the study. Science students in public secondary schools two (SS2) in Anambra State, Nigeria made up the population. The study sample comprised 450 SS2 science students, selected using a multi-stage sampling technique. The instrument for data collection was a researcher-made questionnaire titled "Questionnaire on perceived influence of computer literacy on science students' academic performance" (QPICLSSAP). The instrument was validated, and reliability was determined using Cronbach's alpha; indices of 0.89, 0.81, 0.88, and 0.78 were obtained for sections A, B, and C, and the overall reliability was 0.86. The mean and standard deviation were used to analyse the data with respect to the research questions. The study found that the level of computer literacy among science students in Anambra State, Nigeria, is low. Also, the perceived influence of computer literacy on science students' academic performance includes ensuring efficient software application, improving students' ICT self-efficacy, communication, understanding, feedback, retention, and access to learning resources. The factors that affect science students' computer literacy include parental socioeconomic status, the lack of refresher courses such as seminars and workshops, students' limited access to available computer systems, students' attitude towards computers, shortage of qualified personnel, and lack of infrastructure. Some strategies towards enhancing science students' literacy were noted, as the researchers believe that computer literacy is achievable in Nigeria if technological tools are provided, if real-world examples are integrated into science lessons using information and communication technology, and if collaboration and communication among students are promoted and a culture of experimentation and innovation in schools is fostered.

Keywords: Computer Literacy, Science Students, Academic Performance, influencing factors, secondary education, and Nigeria

Introduction

Information and communication technology (ICT) has become a game-changer in the rapidly evolving educational landscape, particularly in science education. ICT integration in the classroom aims to improve the learning process by making it more participatory, accessible, and successful rather than merely introducing technology for the sake of novelty. Computers provide dynamic, interactive, and visually rich learning environments that enhance students' understanding of complex scientific ideas. Understanding how ICT may improve science instruction is crucial for both teachers and students as the world of education becomes increasingly digitally focused, and its ability to promote accessibility and personalised learning (Teacher Institute, 2023; Rocha-Fernandes et al., 2019).

Similarly, Chattopadhyay (2025) emphasises that the use of computers and other ICT tools has revolutionised the teaching and learning of science, making it more interactive, engaging, and effective. Through simulations, virtual experiments, and real-time data analysis, ICT improves students' comprehension of difficult scientific topics by combining digital tools, multimedia resources, and online platforms. ICT offers opportunities for experiential learning in science education, enabling students to work together on scientific studies outside the conventional classroom, visualise complex concepts, and conduct virtual labs. Teachers can design dynamic classes that accommodate a variety of learning styles by utilising interactive whiteboards, instructional software, and online resources.

Additionally, ICT encourages students to investigate, try new things, and hone their critical thinking abilities through inquiry-based learning (Chattopadhyay, 2025; Edutopia, 2019). Students can participate in self-paced study, stay current with scientific developments, and establish connections with international scientific communities by accessing extensive digital repositories. ICT integration into science education is crucial for fostering curiosity, improving problem-solving skills, and preparing students for upcoming scientific challenges as technology develops. However, despite the transformative impact of ICT on science teaching and learning, many students still cannot fully benefit from these technological opportunities due to gaps in foundational computer literacy. This disconnect between ICT potential and actual student outcomes becomes evident when examining students' academic performance, particularly in computer and science subjects.

Academic performance is the achievement outcome that demonstrates how well a learner or student enrolled in a school system achieves a specific objective that is the main focus of the instructional environment. It is regarded as a crucial standard for evaluating the information and abilities pupils gain throughout classroom instruction. In this study, academic achievement is defined as a learning outcome determined by the grades or test scores students receive. In secondary schools across Nigeria, particularly in Anambra State, students' academic performance in computer studies has consistently been low. Edeh et al. (2021) showed a sustained deterioration in students' academic achievement in computer studies at the senior secondary school level in Nigeria, supporting this unpleasant condition. Students' academic achievement varies, according to computer study results from the West African Examination

Council (WAEC, 2019–2025) and results from the Anambra State Ministry of Education in the same year. In a similar vein, Ezeanyika and Okigbo (2021) noted that although computer studies are important for the advancement of the country, society, and individuals, students' performance on computer studies exams has not improved.

According to Nwafor et al. (2019), the majority of WAEC students and candidates demonstrated little to no comprehension of the syllabus's contents, as evidenced by their responses, which included, among other things, an inability to distinguish between data and information, an inability to define or explain terms or acronyms, basic programming and the use of keywords in term definitions, and misinterpretation of computer files. One way to minimise poor academic performance and improve computer use is to improve students' computer literacy by stimulating their interest during subject instruction. Such experiences help students develop scientific identities and improve their confidence in science-related tasks (Edutopia, 2019).

For everyone, but especially for students, computer literacy is essential. Computer literacy, according to Reynolds (2018), is an awareness of the capabilities of hardware and software, as well as how computers and the internet can improve students' educational experiences. It is the fundamental knowledge of how to use computers and related devices, such as tablets and smartphones. Therefore, having computer literacy allows a learner to adapt to the quickly evolving technological landscape. Many people find it difficult to comprehend the systems necessary for computer literacy, particularly those who were not exposed to technology as children.

Computer utilisation requires the development of a variety of technical and cognitive skills, problem-solving abilities, and the capacity to process text and symbols, all of which may not be apparent to those with an intuitive grasp of computer use. There are many levels of computer literacy, from simple computer use to sophisticated programming, and parents might not realise their child has slipped behind. Turning a computer on and off, utilising an operating system, using software applications, using the internet, and navigating a computer using menus and search functions are all examples of basic computer literacy (Leonard, 2019). Students' academic performance is greatly influenced by computer literacy, and to function well in academic settings, they must be computer-literate and skilled (Jarvis & Pastuszka, 2019).

However, Nomsa (2017) identified the lack of knowledge and skills, time, equipment, maintenance, internet connectivity, and insufficient funds as problems that led to the implementation of computer science. A study by Udeogalanya (2022) found that during the COVID-19 pandemic, computer literacy was favourably associated with academic performance among students. Similarly, Ben Youssef et al. (2022) examined the influence of information and computer literacy on students' academic performance and found that computer literacy positively affects it. Despite the transformative prospective of computers to enrich science teaching and learning, many science students in Nigeria still exhibit low levels of computer literacy, limiting their ability to benefit from digital learning opportunities. Persistent challenges, such as inadequate ICT facilities and limited access to digital resources, continue to hinder students' academic performance in computer-related subjects. Evidence from national

examinations, as mentioned earlier, shows fluctuating and generally poor outcomes in computer studies, suggesting that insufficient computer literacy negatively affects students' scientific understanding and overall achievement. Therefore, investigating students' literacy levels, influencing factors, and improvement strategies is imperative.

Purpose of Study

The aim of this study is to determine the perceived influence of computer literacy on science students' academic performance in Onitsha South Local Government Area. Specifically, the study intends to determine the:

1. Level of computer literacy among science students in Anambra State.
2. Perceived influence of computer literacy on science students' academic performance.
3. Factors affecting science students' computer literacy.
4. Strategies towards enhancing science students' computer literacy.

Research Questions

The following research questions will guide the study.

1. What is the level of computer literacy among science students in Anambra State, Nigeria?
2. What is the perceived influence of computer literacy on science students' academic performance?
3. What are the factors that affect science students' computer literacy?
4. What are the strategies that will enhance science students' computer literacy?

Methodology

The research design adopted in this study was the descriptive survey design. A descriptive survey design is one in which a group of people is studied by collecting and analysing data from only a few individuals or items considered representative of the entire group (Nworgu, 2018). The population of this study consisted of all the science students in public secondary schools two (SS2), in Anambra State, Nigeria. The sample size of the study was 450 SS2 science students. Multiple-stage sampling techniques were used. Specifically, purposive sampling was used to select three of the six educational zones in the State, while simple random sampling was used to select five schools in three selected zones, and purposive sampling was also used to select 30 students from the 15 sampled schools.

The research instrument that was used for this study was a questionnaire titled "Questionnaire on perceived influence of computer literacy on science students' academic performance" (QPICLSSAP). The questionnaire comprised of four parts, section A, B, C and D. Section A deals with the levels of science student computer literacy while Section B deals with the Perceived influence of computer literacy on science students' academic performance. Section C explored the factors affecting science students' computer literacy, and Section D centred on strategies to enhance it. A four-point Likert scale of Strongly Agreed (SA) = 4, Agreed (A) = 3, Disagreed (D) = 2 and Strongly Disagreed (SD) = 1 was used. The instrument was validated by three experts from the Department of Science Education, Nnamdi Azikiwe University, Awka. The instrument's reliability was determined using Cronbach's alpha, yielding 0.89, 0.81, 0.88, and 0.78 for sections A, B, C, and D, respectively, with an overall reliability of 0.86.

The questionnaires were administered to respondents by the researchers by hand/face-to-face, to enhance the return rate. The respondents were briefed on the researchers' intentions and motives through an introductory letter, which will also enable the researchers to gain access to the respondents. The data were collected and analysed with mean and standard deviation. Any item with a mean rating of 2.5 and above indicated a positive response or agreement, while items with a mean rating of 2.49 and below indicated a negative response or disagreement. To determine the level of computer literacy among science students in Anambra State, Nigeria, the real limit of numbers was used as follows: low level (2.49 and below), moderate level (2.50-3.49) and high level (3.50-4.00).

Results

Research Question One:

What is the level of computer literacy among science students in Anambra State, Nigeria?

Table 1: Mean and standard deviation of the level of computer literacy among science students in Anambra State, Nigeria

S/N	Statement	Mean	SD	Remark
1.	I can identify hardware components	3.57	0.76	High Level
2.	I know the use of hardware components	2.55	1.11	Moderate Level
3.	I know how to boot a computer system	3.50	0.95	High Level
4.	I can explore the internet	2.54	1.13	Moderate Level
5.	I can make simple graphic designs	1.74	0.85	Low Level
6.	I can save and print out files	1.92	1.06	Low Level
7.	I can explore computer systems efficiently	1.99	1.00	Low Level
8.	I have access to a computer and use it at all times	2.37	1.14	Low Level
9.	I can use the keyboard to execute commands on the computer	2.33	1.11	Low Level
10.	I can effectively use the mouse to execute commands on the computer	2.17	1.04	Low Level
11.	I have good general knowledge of computer packages, such as MS Word and PowerPoint.	2.57	0.85	Moderate Level
	Cluster Mean	**2.48**	**0.40**	**Low Level**

The result in Table 1 shows that items 1 and 3 were at a high level, while items 2, 4 and 11 were at a moderate level, and items 5, 6, 7, 8, 9 and 10 were at a low level. Moreover, 2.48 and 0.40 were obtained as the overall mean score and standard deviation, respectively. This indicates that the level of computer literacy among science students in Anambra State is low.

Research Question Two:

What is the perceived influence of computer literacy on science students' academic performance?

Table 2: Mean and standard deviation of the perceived influence of computer literacy on science students' academic performance

S/N	Statement	Mean	SD	Remark
12.	Computer literacy through the application of software improves science students' learning outcomes.	2.92	0.81	Accepted
13.	It improves science students' ICT self-efficacy, which enhances their learning outcomes.	3.43	0.59	Accepted
14.	It promotes effective communication among students, parents, and colleagues	3.19	0.80	Accepted
15.	Computer literacy enhances science students' learning and provides feedback	2.90	0.83	Accepted
16.	Computer literacy gives science students a better understanding and enhances their retention capability by using different information technology tools	3.08	0.83	Accepted
17.	It ensures the easy creation of study materials	3.35	0.67	Accepted
18.	It provides swift and enormous access to learning resources	2.83	1.21	Accepted

The result in Table 2 shows that all the items 12, 13, 14, 15, 16, 17 and 18 with mean scores of 2.92, 3.43, 3.19, 2.90, 3.08, 3.35 and 2.83, respectively, were all accepted since their mean scores were above the mean cut-off point of 2.50. This indicates that the perceived influence of computer literacy on science students' academic include its ability to ensure efficient software application for a better learning outcome, improve science students' ICT self-efficacy and learning outcomes, promote effective communicate among science students, parents, and colleagues, give science students a better understanding and enhance their feedback and retention, ensure easy creation of study materials and provide swift and enormous access to learning resources

Research Question Three:

What are the factors that affect science students' computer literacy?

Table 3: Mean and standard deviation of the factors that affect science students' computer literacy

S/N	Statement	Mean	SD	Remark

19.	Parental socioeconomic status affects computer literacy	3.40	0.76	Accepted
20.	Lack of refresher courses (seminars and workshops) affects computer literacy	3.30	0.53	Accepted
21.	Students' limited access to available computer systems affects computer literacy	3.25	0.79	Accepted
22.	The attitude of science students towards computers affects computer literacy	3.57	0.60	Accepted
23.	Shortage of qualified personnel affects computer literacy	3.46	0.55	Accepted
24.	Lack of infrastructural facilities affects computer literacy	3.42	0.73	Accepted

The result in Table 3 shows that all the items 19, 20, 21, 22, 23 and 24 were all accepted since their mean scores were above the mean cut-off point of 2.50. This indicates that the factors that affect science students' computer literacy include parental socioeconomic status, lack of refresher courses like seminars and workshops, students' limited access to available computer systems, attitude of science students towards computers, shortage of qualified personnel and lack of infrastructural facilities.

Research Question Four:

What are the strategies that will enhance science students' computer literacy?

Table 4: Mean and standard deviation of the strategies that will enhance science students' computer literacy

S/N	Statement	Mean	SD	Remark
25.	Schools should foster a culture of experimentation and innovation among science students to encourage the use of new tools and technologies, which will improve their computer literacy.	3.10	0.73	Accepted
26.	Encourage collaboration and communication with peers using digital tools like online discussion boards and collaborative writing platforms.	3.01	0.91	Accepted
27.	Provide access to technological tools and resources that can enhance the teaching and learning of science using computers.	2.90	0.89	Accepted
28.	Participate in online courses, tutorials, and webinars to learn new digital skills and stay current with emerging technologies	3.11	0.91	Accepted
29.	Teachers should establish clear learning goals and objectives for computer literacy, and use assessments to measure student progress and identify areas for improvement.	2.32	0.88	Rejected
30.	Teachers should be encouraged to incorporate real-world examples and applications of computer literacy into their lessons to help students understand the relevance and practicality of computers.	3.42	0.66	Accepted

The result in Table 4 shows that items 25, 26, 27, 28 and 30 were all accepted since their mean scores were above the mean cut-off point of 2.50, while item 29 was rejected because it had a mean score below 2.50. This indicates that the strategies that will enhance science students' computer literacy include fostering a culture of experimentation and innovation among students in schools, encouraging collaboration and communication with peers using digital tools like online discussion boards and collaborative writing platforms, providing access to technology tools and resources, participating in online courses, tutorials, and webinars to learn new digital skills and stay current with emerging technologies and encouraging teachers to incorporate real-world examples and applications of computer literacy into their lessons to help students understand the relevance and practicality of computer.

Discussion

The findings of the study showed that the level of computer literacy among science students in Anambra State, Nigeria, is low. This was as a result of students' inability to do the following: make simple graphic designs, save and print out files, explore computer systems efficiently, have access to a computer and use it at all times, and use the keyboard and mouse to execute commands in the computer. This aligns with Lateef et al. (2024), who revealed that quite a large number of secondary school students in developing countries like Nigeria have poor computer literacy competency. This is in line with the findings of Eze (2023), who found that students are having difficulty understanding the basic concepts and principles of computer studies, and that the majority of students have poor performance in computer studies and do not possess adequate computer skills. However, while Igenewari and Michael (2018) found that the computer literacy level of the secondary school teachers was high, the researchers stated that the impact of on students' computer literacy knowledge was low, and the stated factors affect the computer literacy programme in the state schools, which would definitely lead to low computer literacy.

The findings of the study showed the perceived influence of computer literacy on science students' academic performance include ensuring efficient software application for a better learning outcome, improving students' ICT self-efficacy which enhances their learning outcomes, promoting effective communicate among students, parents, and colleagues, giving students a better understanding and enhancing feedback and retention, ensuring easy creation of study materials and providing swift and enormous access to learning resources. This finding is in agreement with Adesuyi (2025), which was conducted within the Nigerian educational context and indicated a significant positive correlation between higher computer literacy and academic performance. Specifically, students with considerable knowledge of computer literacy tended to perform better academically compared to their peers with limited computer skills. Also, Abari et al. (2022) revealed that there is a significant impact of computer literacy on secondary school students' achievement in computer science and also that there is a significant impact of computer literacy on male and female secondary school students' achievement in computer science.

The findings of the study showed that the factors that affect science students' computer literacy include parental socioeconomic status, lack of refresher courses like seminars and workshops, students' limited access to available computer systems, attitude of students towards computers, shortage of qualified personnel and lack of infrastructural facilities. This aligns with Muhammad et al. (2019), who reported that inadequate and unqualified teachers, a lack of internet facilities, limited access to computers, and poorly equipped computer laboratories can affect students' competence in computer use. For Oladunjoye and Benwari (2020), computer literacy among undergraduate students is often affected by students' socioeconomic status, limited access to computers, and attitudinal gaps. The study by Ajegbomogun et al. (2022) also identified inadequate space, insufficient computer systems, and inadequate ICT training programmes as major institutional challenges affecting students' computer literacy and use of electronic resources

The findings of the study showed the strategies that will enhance science students' computer literacy include fostering a culture of experimentation and innovation among students in schools to encourage the use of new tools and technologies, encouraging collaboration and communication with peers using digital tools like online discussion boards and collaborative writing platforms, providing access to technology tools and resources, participating in online courses, tutorials, and webinars to learn new digital skills and stay current with emerging technologies and encouraging teachers to incorporate real-world examples and applications of computer literacy into their lessons to help students understand the relevance and practicality of computer. This finding is in agreement with Nwokike & Eze (2019), who revealed that upper basic school students in Enugu State need computer literacy skills, especially the ability to manipulate the keyboard, for excellent performance in JAMB CBT. The researchers also revealed that one strategy for developing the computer skills of upper basic secondary school students in Enugu State is the effective utilisation of computers to prepare students for CBT. This is in line with the findings of Bunu (2018), who stressed the need for the government to increase the number of computers in schools and ensure the application of computer software across various subjects for teachers to improve the teaching and learning process in schools. The researcher also suggested increased computer awareness among students, parents' assistance in providing personal computers for their children, and adequate training in the use of computer programmes for teachers and students to support effective science lesson delivery. This outcome also aligned with the study carried out by Mbwesa (2021), Nwafor et al. (2022) and Akpabio and Ogiriki (2017) that revealed that the availability and use of ICT facilities can help students explore enormous possibilities for acquiring information for schooling purposes and can improve teaching and learning of school subjects.

Conclusion

The researchers concluded that science students in Anambra State, Nigeria, had limited computer literacy. The science students in this study agreed that computer literacy has a significant influence on their academic performance by ensuring efficient software application, improving their ICT self-efficacy, communication, understanding, feedback, retention, and access to learning resources. It was also evident that the low computer literacy level of the

science students was due to several factors, including parental socioeconomic status, the lack of refresher courses such as seminars and workshops, limited access to computer systems, students' attitudes towards computers, a shortage of qualified personnel, and a lack of infrastructure. Some solutions were proffered to enhance science students' computer literacy and they include fostering a culture of experimentation and innovation, encouraging collaboration and communication with peers using digital tools, providing access to technology tools and resources, participating in online courses, tutorials, and webinars to learn new digital skills and integrating real-world examples into their science lessons to help students understand the relevance and practicality of computer.

Recommendation

The following recommendations were made based on the findings of the study and the implications of the study:

1. To increase students' academic performance and computer literacy, administrators should make sure that science instructors and students receive training and retraining through conferences, seminars, and workshops.
2. During their learning processes, students should be instructed on how to use the computer resources to look up reliable material and engage in various science activities.
3. All levels of government should provide computers with internet connectivity in every school so that scientific instructors and students can use them for teaching and learning.
4. Students should be discouraged from being addicted to internet usage so as to get time to focus on their studies.
5. It is imperative that school administrators work with the private sector to supply computers and other educational resources required for science instruction.
6. To help scientific students practise and develop their computing abilities, parents through the PTA and other significant stakeholders in our education can support schools by giving educational resources such as laptops, desktop computers, multimedia, generating sets, internet, etc.

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