INTERNATIONAL JOURNAL OF INNOVATIVE APPROACHES TO LEARNING AND TEACHING
IJIALT

A COMPARATIVE ANALYSIS OF COMPUTER PROVISION AND USAGE IN TEACHING AND LEARNING OF SCIENCE IN PRIVATE AND PUBLIC SECONDARY SCHOOLS IN ANAMBRA STATE, NIGERIA

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Abstract

The use of computers for scientific education is essential to the educational growth and collaboration of every nation and its students. This is as a result of the ever-increasing importance of information and communication technology (ICT) in the digital age. The study examined the provision and use of computers in teaching and learning in the sciences in public and private secondary schools in Awka South Local Government Area (LGA) of Anambra State, Nigeria. Four structured research questions guided the study. The study adopted a descriptive survey research design. The population consisted of all the 1790 senior secondary two (SS2) students in the 19 public and 17 private schools in Awka South Local Government Area (LGA) of Anambra State, Nigeria. A simple random sampling technique was used to select 180 students (100 from public & 80 from private schools) in the selected 6 schools in the State. The instrument for data collection was titled "Availability and usage of computers for teaching and learning of Science Student Questionnaire (AUCTLSQ)". The research instrument was a structured questionnaire on a two-point and four-point Likert scale designed by the researchers. The AUCTLSSQ was validated by three experts in the Department of Science Education, Nnamdi Azikiwe University, Awka, and a reliability index of 0.83 was obtained using Cronbach's Alpha. Data was analysed using frequency, percentage, mean and standard deviation. The study found that most of the listed ICT equipment was available in private schools, in contrast to what was observed in public schools in Awka Local Government Area of Anambra State, Nigeria. Further findings revealed that computers are used to a low extent in public secondary schools for teaching and learning science, whereas in private schools, they are used to a moderate extent. The challenges identified which affects the use of ICT in teaching and learning of science in public and private secondary schools in Awka South Local Government Area included poor electricity supply, lack of funds, lack of internet access, large class sizes among others, whereas the solution proferred was that the government should ensure a regular power supply, regular in-service training and retraining, and provision of

internet accessand computers to enable the effective use of ICT resources in science teaching and learning in secondary schools.

Keywords: ICT Availability, Computer Utilisation in Science Education, Public–Private School Disparities, Challenges and Solutions of ICT Integration, Science Teaching and Learning Resources

Introduction

Since the invention of the computer, the world has seen tremendous technological growth. An electrical device that can process, store, and retrieve data is called a computer (O'Regan, 2021). It is an essential component of human knowledge that has changed people from living a manual lifestyle to one that is more complex, sophisticated, and focused on science and is used in our everyday activities for quick and efficient teaching and learning. While learning means understanding, comprehending, and applying skills, teaching is an interactive process between the teacher and the student to transmit necessary knowledge and facilitate comprehension, whether in public or private schools (Omiyale, 2025).

Secondary school (private or public) is generally the final stage of compulsory education in Nigeria. Public Secondary Schools are educational institutions that provide secondary education to students by the government, while Private secondary schools are schools founded, conducted, and maintained by a private group rather than the government, usually charging tuition and often following a particular philosophy or viewpoint, among others. The Federal Ministry of Education (2014) explained that secondary school is the form of education children receive after primary education and before the tertiary stage. This implies that secondary school education is for young people, usually between the ages of eleven and eighteen.

According to Onoja (2015), secondary education through science and technology is expected to provide a platform for developing scientific literacy and building up essential scientific knowledge and skills for life-long learning in science and technology through computer science. As science describes and explains natural occurrences through experimentation and observation acquired through scientific inquiry and by developing scientific literacy (Nwafor et al., 2024). Therefore, science is systematic in its approach. The aforementioned claim was highlighted by Shana and Abulibdeh (2020) and Hansson (2016), who argued that scientific research and experimentation are crucial to advancing science because laboratory research has enabled numerous inventions, scientific progress, and groundbreaking discoveries. Science education is improved and made more interesting through the study of science,

preparing students for success in a world that is becoming increasingly scientific and technological.

Nonetheless, the availability and usage of computers in classrooms today are crucial and constitute a rapidly expanding advancement in education. A new aspect of science education has emerged as a result of advances in computer programming. Electronic learning resources, including mobile phones, digital photos, maps, scanned historical documents, animated video demonstrations, and electronic books, are used to handle and manipulate a wide range of concepts and information in nearly every aspect of life, from business to various professions and instructors to government (Kaware & Sain, 2015). As a result, it is undeniable that computers are now a part of our educational system. In addition to helping schools evaluate data, computers, the internet, telephones, projectors, and broadcasting technologies like radio and television are used as ubiquitous instruments for efficient teaching and learning.

Usman and Madudili (2020) and Ogunshola (2016) assert that the availability and use of computers in secondary schools can enhance the standard of instruction in academic areas, especially the sciences. There is no denying that computers play a special role in raising the standard of science education since they can inspire pupils to learn and help them develop into autonomous, responsible learners. In addition, some institutions have integrated interactive computer-assisted learning into their curricula to give science and art students the chance to master particular criteria or objectives. Regarding computer use in students' learning mathematics, Setiyani et al. (2020) found that students who regularly used online platforms such as Quizizz during their mathematics learning showed significant improvement in their problem-solving skills and overall understanding of mathematical concepts. Also, Shana and Abulibdeh (2020) found that students who used practical, hands-on, and technology-supported science activities demonstrated higher understanding of scientific concepts and greater engagement and motivation in the learning process.

Students can interact with knowledge in an active, self-directed, and productive way thanks to the use of computers, which also transforms science teaching and learning processes and produces a powerful learning environment. A computer is more than just a tool to supplement or replace current instructional techniques. A computer is thought to be a crucial tool for supporting innovative teaching and learning methods. Students' skills should be developed using it. Students who participate in active, experiential learning are more likely to retain information for longer periods of time and acquire critical skills necessary for modern-day living. Due to this significant issue, the Center for Information Technology and Development

(CITAD) (Kano, 2021) called on the government to fully incorporate computer studies into secondary school curricula in order to raise computer literacy among the nation's students and to provide information and communications technology (ICT) facilities in labs and classrooms to support the subject's instruction.

In fact, innovative use of computers and other educational technology can facilitate student-centred learning by supporting the cognitive, affective, metacognitive, and motivational learning processes (Shehata et al., 2024). Hence, every classroom, as stated by the Federal Ministry of Education (2014), should use learning technologies to enhance student learning across all subjects, especially sciences, as they can engage students' thinking, support the acquisition of scientific skills, and foster decision-making and reasoning.

Notwithstanding the government's policy, there is still a wide disparity between policy pronouncements and implementation in public and private secondary schools in Nigeria. This is evident today in the level of computer literacy among secondary students and their performance in external examinations such as the West African Senior Secondary School Certificate Examination Council (WASSCE), with years of poor performance. The poor ICT compentence and computer literacy among students, according to Davidson and Ezeh (2023) and Usman and Madudili (2020), could be a result of the insufficient access or non-usage of computers in teaching and learning in schools. For instance, Nwafor et al. (2022a) observed that, in many public secondary schools, chemistry students reported that their use of ICT in teaching and learning is mostly affected by inadequate infrastructure, poor electricity supply, and a lack of computer facilities. Amuchie (2015), who examined the accessibility and use of computer resources in teaching and learning in secondary schools, stated that many schools are unable to connect to the World Wide Web due to the high cost of internet access and poor facilities. Orji and Ukeh (2022) reported that irregular power supply, administrative barriers, lack of skills, high costs, and limited internet access have been persistent problems that have militated against computer use in the Nigerian education system. Nwana et al. (2017), who conducted a study on the availability and utilisation of computer facilities in teaching, revealed that computer facilities are not available for teaching schools.

From the foregoing, it can be deduced that computer availability and usage are necessary in secondary schools in Nigeria, and in Anambra State in particular, for the delivery of the secondary school curriculum. Moreover, it has been found that computers and other Information and Communication Technology (ICT) devices are grossly inadequate in schools for effective application in the teaching–learning process. Despite these studies, a gap persists in the provision and use of computers in the teaching and learning of students in public and

private secondary schools in Anambra State, Nigeria. Hence, there is a need to empirically quantify the availability and extent of use of computer facilities in teaching and learning of sciences. Therefore, this gap led the researchers to embark on this study in order to assess the availability and usage of computers in teaching and learning of sciences in public and private secondary schools in Awka South Local Government Area (LGA) of Anambra State, and the possible solutions that will help to improve the integration of computers in teaching and learning.

Purpose of the Study

The main purpose of the study was to examine the availability and usage of computers in teaching and learning of students in public and private secondary schools in Awka South Local Government Area. Specifically, the study aimed to determine the:

1. The available ICT equipment in teaching and learning of science in public and private secondary schools in Awka South LGA.
2. The extent to which public and private secondary schools use computers in teaching and learning of sciences.
3. The challenges militating against the usage of computers in teaching and learning of science students in both public and private secondary schools.
4. The possible solutions to the challenges facing the use of computers in teaching and learning of science students in both public and private secondary schools.

Research Questions:

The following research questions were raised to guide the study:

1. What are the available ICT equipment in teaching and learning of sciences in public and private secondary schools in Awka South LGA?
2. To what extent do public and private secondary schools use computers in teaching and learning of sciences?
3. What are the challenges militating against the usage of computers in teaching and learning of science students in both public and private secondary schools?
4. What are the possible solutions to the challenges facing the use of computers in teaching and learning of science students in both public and private secondary schools?

Methodology

This study adopted a descriptive survey research design. According to Nworgu (2018), a survey descriptive 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. The study was conducted in Awka South, Anambra State. The population of the study consisted of 1009 public and 781 private senior secondary two (SS 2) science students from 19 public and 17 private secondary schools in the study area. The sample for the study consisted of 180 students (100 from public schools & 80 from private schools). The sampling technique for this study was multi-stage sampling. In stage one, a random sampling technique, specifically a balloting method, was used to select 6 Schools from the local government area. Among the 6 selected schools, the researcher used a purposive sampling approach to select the SS2 classes to be used. The researchers further used simple random sampling to select the SS2 students.

The instrument for data collection was a structured questionnaire. The instrument was made up of 68 Items divided into 4 sections and titled 'Availability and Usage of Computers in Teaching and learning of Science Students Questionnaire' (AUCTLSSQ). The questionnaire was formulated based on each of the study's research questions, with the first and second sections developed by the researchers and the third and fourth sections adapted from Davidson and Ezeh (2023). The respondents were required to respond to each of the items of 'AUCTLSSQ' on a four-point rating Likert scale ranging from VHE = Very High Extent/Strongly Agree =4; HE = High Extent/Agree =3; VLE =Very Low Extent/Disagree = 2; LE = Low Extent/Strongly Disagree =1, and two-point rating Likert scale ranging from; A = available = 2; NA = Not Available = 1. The instrument developed was face-validated by three experts, one each from the Computer Education, Basic Science Education, and Chemistry Education units of the Department of Science Education in the Faculty of Education, Nnamdi Azikiwe University, Awka. Anmabra State, Nigeria. To establish the instrument's reliability, a pilot test was conducted at a secondary school in the Njikoka Local Government Area, which was outside the study area. Twenty questionnaires were administered to SS2 science students, and the Cronbach's alpha reliability coefficient was 0.83. The questionnaire was administered to the respondents by the researchers by hand delivery, during which the intent of the research study was explained. The questionnaires were collected back that same day.

Data collected in the study were analysed using frequency counts, percentages, means, and standard deviations to answer the research question. The decision rule interpretation of the percentage with respect to the available ICT equipment in teaching and learning of computer studies in state and private secondary schools in Awka South LGA was that any item whose frequency percentage is from 50% and above was considered as being available, while those from 49.9% and below were considered not available. Also, 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 extent to which public and private secondary schools in Awka South LGA use computers in teaching and learning, the real limit of numbers was used as follows: low extent (2.49 and below), moderate extent (2.50-3.49) and high extent (3.50-4.00).

Results

Research Question One:

What are the available ICT equipment in teaching and learning of science in public and private secondary schools in Awka South LGA?

Table 1: Frequencies and percentages of the available ICT equipment in teaching and learning of science in public and private secondary schools in Awka South LGA

		Public Schools			Private Schools		
S/N	**Item**	**Available F %**	**Not Available**	**Remarks**	**Available**	**Not Available**	**Remarks**
1.	Computer	90 90.0	10 10.0	A	75 93.75	10 6.25	A
2.	Scanner	42 42.0	58 58.0	NA	78 97.50	2 2.50	A
3.	Printer	40 40.0	60 60.0	NA	76 95.0	4 5.0	A
4.	Multimedia(MM) Projector	35 35.0	65 65.0	NA	64 80.0	16 20.0	A
5.	Electronic Whiteboard (e-whiteboard)	32 32.0	68 68.0	NA	62 77.5	18 22.5	A
6.	Card readers(e-readers)	6 6.0	94 94.0	NA	32 40.0	48 60.0	NA
7.	E-graphics board	8 8.0	92 92.0	NA	72 90.0	8 10.0	A
8.	Powerbank devices, e.g UPS	86 86.0	14 14.0	A	79 98.75	1 1.25	A
9.	Computer pen/pen recorder	4 4.0	96 96.0	NA	30 37.50	50 62.5	NA
10.	MoDems (External/Internal)	44 44.0	56 56.0	NA	72 90.0	8 10.0	A
11.	CD-ROM	47 47.0	53 53.0	NA	78 97.50	2 2.50	A
12.	Audio and video discs	38 38.0	62 62.3	NA	76 95.0	4 5.0	A
13.	Flash memories	62 62.0	38 38.3	A	74 92.5	6 7.5	A
14.	Slides for PowerPoint presentations	44 44.0	56 56.7	NA	78 97.50	2 2.5	A
15.	Courseware templates	7 7.0	93 93.0	NA	28 35.0	52 65.0	NA
16.	E-books as high-tech materials	32 32.7	68 68.3	NA	74 92.5	6 7.5	A
17.	Magnetic cards for recording and recall of	28 28.3	72 72.7	NA	34 42.5	46 57.5	NA

	Instructional information.						
18	Computer worksheets	40 40.0	60 60.0	NA	60 75.0	20 25.0	A
19.	Graphics software	36 36.0	64 64.0	NA	64 80.0	16 20.0	A
20.	Programmed Instruction materials	24 24.0	76 76.0	NA	56 70.0	26 30.0	A
21.	Smartphone	32 32.0	68 33.3	NA	62 77.5	18 22.5	A
22.	Mouse/keyboard	92 92.0	8 10.0	A	74 92.5	6 7.5	A

The results in Table 1 reveal the frequencies and percentages of the available ICT equipment for teaching and learning of science in public and private secondary schools in Awka South LGA. For public schools, the Table shows that 4 of the 22 listed ICT equipment are available for teaching and learning of science in secondary schools, while 18 are not available. This implies that the available ICT equipment in teaching and learning of science in public secondary school in Awka South LGA include computer, power bank devices e.g. UPS, flash memories, and mouse/keyboard, whereas printer, electronic whiteboard (e-whiteboard), smart phone, computer worksheets, scanner, multimedia(MM) projector, card readers(e-readers), e-graphics board, computer pen/pen recorder, Modems (External/Internal), CD-ROM, audio and video discs, slides for power-point presentations, courseware templates, e-books as high-tech materials, magnetic cards, graphics software and programmed instruction materials are not available. On the other hands, for the private schools, the following ICT equipment are available for teaching and learning of science, they include computer, scanner, printer, power bank devices e.g. UPS, flash memories, electronic whiteboard (e-whiteboard), computer worksheets, multimedia(MM) projector, e-graphics board, Modems (External/Internal), CD-ROM, audio and video discs, slides for power-point presentations, e-books, graphics software, programmed instruction materials, smartphones and mouse/keyboard while card readers(e-readers), computer pen/pen recorder, courseware templates, and magnetic cards are not available.

Research Question Two:

To what extent do public and private secondary schools use computers in teaching and learning of science?

Table 2: Mean and standard deviation of the extent public and private secondary schools use computers in teaching and learning of science

		Public Schools			**Private Schools**		
S/N	**Item**	**Mean**	**SD**	**Remarks**	**Mean**	**SD**	**Remarks**
23.	Computer	3.67	0.70	High Extent	3.82	0.42	High Extent
24.	Scanner	2.47	1.41	Low Extent	3.20	0.44	Moderate Extent

25.	Printer	2.53	1.41	Moderate Extent	3.74	0.51	High Extent
26.	Multimedia(MM) Projector	1.77	1.06	Low Extent	3.62	0.38	High Extent
27.	Electronic Whiteboard (e-whiteboard)	3.03	1.17	Moderate Extent	3.10	0.62	Moderate Extent
28.	Card readers(e-readers)	1.23	0.76	Low Extent	1.42	0.88	Low Extent
29.	E-graphics board	1.80	1.67	Low Extent	3.50	0.61	High Extent
30.	Powerbank devices, e.g UPS	2.13	1.34	Low Extent	3.47	0.63	Moderate Extent
31.	Computer pen/pen recorder	1.67	1.05	Low Extent	1.82	0.92	Low Extent
32.	MoDems (External/Internal)	2.17	1.22	Low Extent	2.88	1.13	Moderate Extent
33.	CD-ROM	2.03	1.23	Low Extent	3.74	0.67	High Extent
34.	Audio and video discs	1.77	1.23	Low Extent	3.07	0.74	Moderate Extent
35.	Flash memories	1.87	1.26	Low Extent	3.36	0.82	Moderate Extent
36.	Slides for PowerPoint presentations	1.53	0.92	Low Extent	2.63	1.12	Moderate Extent
37.	Courseware templates	1.30	0.78	Low Extent	2.10	1.06	Low Extent
38.	E-books as high-tech materials	1.30	0.78	Low Extent	2.72	0.66	Moderate Extent
39.	Magnetic cards for recording and recall of Instructional information.	1.53	0.92	Low Extent	1.60	0.72	Low Extent
40	Computer worksheets	2.77	0.96	Moderate Extent	2.20	0.84	Low Extent
41.	Graphics software	2.33	1.11	Low Extent	2.40	0.86	Low Extent
42.	Programmed Instruction materials	2.37	1.20	Low Extent	2.16	0.62	Low Extent
43.	Smartphone	2.80	1.28	Moderate Extent	2.28	0.80	Low Extent
44.	Mouse/keyboard	3.53	0.99	High Extent	3.78	0.35	High Extent

		2.16	**0.60**	**Low Extent**	**2.85**	**0.58**	**Moderate Extent**

The result in Table 2 shows that for public schools items 23 and 44 were to a high extent, whereas, items 25, 27, 40 and 43 were to a moderate extent and items 24, 26, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 41 and 42 were to a low extent. Moreover, for the public schools, the overall mean score and standard deviation were 2.16 and 0.60, respectively. Furthermore, Table 2 shows that for private schools items 23, 25, 26, 29, 33, and 44 were to a high extent, whereas, items 24, 27, 30, 32, 34, 35, 36, and 38 were to a moderate extent and items 28, 31, 37, 39, 40, 41, 42, and 43 were to a low extent. Also, the overall mean and standard deviation for private schools were 2.85 and 0.58, respectively. This indicates that ICT equipment is used to a low extent in public schools for teaching and learning science, while it is used to a moderate extent in private secondary schools.

Research Question Three:

What are the challenges militating against the use of computers in teaching and learning of science students in both public and private secondary schools?

Table 3: Mean and standard deviation of the challenges militating against the use of computers in teaching and learning of science students in both public and private secondary schools

S/N	Item	Mean	SD	Remark
45.	Irregular maintenance of computer equipment or facilities hinders the usage in teaching science students	3.60	0.88	Accepted
46.	Inadequate electricity supply hinders the usage of Computers in teaching and learning of science	3.80	0.77	Accepted
47.	Lack of funding by the government militates against the use of computer equipment in teaching and learning for science students	3.57	0.72	Accepted
48.	Lack of internet access militates against the use of computers in teaching or learning for students	3.60	0.67	Accepted
49.	Large class size militates against the use of computers in teaching and learning of science subjects.	3.33	0.70	Accepted
50.	The length of time allocated does not give room for using the Computer in teaching and learning for science students	3.33	0.79	Accepted
51.	The fear of replacing a damaged computer tool hinders the teachers from using the item	3.20	0.98	Accepted
52.	There are enough computers in my school laboratory	1.60	0.88	Rejected

53.	There is a constant electric power supply in the laboratory	1.93	1.03	Rejected
54.	The computer system is too difficult to operate.	2.63	0.95	Accepted
55.	I have limited knowledge of computers.	3.13	0.62	Accepted
56.	There is no access to a personal computer.	3.30	0.94	Accepted

The result in Table 3 reveals that all the items 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55 and 56 with the mean scores of 3.60, 3.80, 3.57, 3.60, 3.33, 3.33, 3.20, 2.63, 3.13 and 3.30 respectively were accepted as they were above the mean cut-off points of 2.50 while items 52 and 53 were rejected because there mean scores (1.60 & 1.93) were below mean cut-off points of 2.50. This indicates that the challenges militating against the use of computer in teaching and learning of science students in public and private secondary schools include irregular maintenance of computer equipment or facilities, inadequate electricity supply hinders, lack of funding by the government, lack of internet access, large class size, length of time allocated to Computer studies, fear of replacing a damaged computer tool, difficulty in operating computer system, limited knowledge about computer and lack of access to personal computer.

Research Question Four:

What are the possible solutions to the challenges facing the use of computers in teaching and learning of science students in both public and private secondary schools?

Table 4: Mean and standard deviation of the possible solutions to the challenges facing the use of computers in teaching and learning of science students in both public and private secondary schools

S/N	Item	Mean	SD	Remark
57.	The government should provide funding to schools for computer procurement	3.48	0.50	Accepted
58.	Provision of technical support by the government to schools to assist in the proper use of computers	3.87	0.33	Accepted
59.	Proper maintenance and repairs of computers should be made available in the school	3.42	0.66	Accepted
60.	There should be regular in-service training for science teachers	3.29	0.61	Accepted
61.	Providing access to the internet	3.54	0.54	Accepted
62.	Provision of enough power supply	3.72	0.45	Accepted
63.	Granting enough time for science teachers and students to practice using the computer facilities in the laboratory.	3.50	0.54	Accepted
64.	Schools should make it compulsory for all teachers to take part in computer training	3.71	0.45	Accepted
65.	Providing enough security to protect computer facilities from theft.	3.54	0.50	Accepted

66.	Internet service providers should grant schools free internet access for browsing.	3.67	0.53	Accepted
67.	Awarding of personal computers, such as laptops and tablets, to students and teachers to boost learning activities.	3.87	0.50	Accepted
68.	Monitoring computer usage in schools by the government to ensure the effective use of ICT facilities.	3.56	0.54	Accepted

The results in Table 4 reveal that all the items 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, and 68 were accepted because they were above the mean cut-off point of 2.50. This indicates that the possible solutions to the challenges facing the use of computer in teaching and learning of science students in public and private secondary school include provision of funds by the government to schools for computer procurement, provision of technical support, proper maintenance and repairs of computer, regular in-service training for science teachers, provision of access to the internet, provision of enough power supply, granting enough time for teachers and students to practice using computer facilities in the laboratory, making it compulsory for all teachers to take part in computer training, providing enough security to protect computer facilities from theft, granting schools free internet access for browsing, awarding of personal computers like laptops, tablets to students and teachers to boost learning activities and monitoring computer usage in schools by the government to ensure the effective use of ICT facilities.

Discussion

The findings of the study showed that the available ICT equipment in teaching and learning of sciences in public secondary school in Awka South LGA include computer, power bank devices e.g. UPS, flash memories, and mouse/keyboard, whereas printer, electronic whiteboard (e-whiteboard), smart phone, computer worksheets, scanner, multimedia(MM) projector, card readers(e-readers), e-graphics board, computer pen/pen recorder, Modems (External/Internal), CD-ROM, audio and video discs, slides for power-point presentations, courseware templates, e-books as high-tech materials, magnetic cards, graphics software and programmed instruction materials are not available. Conversely, for the private schools, the following ICT equipment are available for teaching and learning of science, computer, scanner, printer, power bank devices e.g. UPS, flash memories, electronic whiteboard (e-whiteboard), computer worksheets, multimedia(MM) projector, e-graphics board, Modems (External/Internal), CD-ROM, audio and video discs, slides for power-point presentations, e-books, graphics software, programmed instruction materials, smartphones and mouse/keyboard while card readers(e-readers), computer pen/pen recorder, courseware templates, and magnetic cards are not available. The findings align with those of Okolo (2019), who found that ICT resources are higher in private schools compared to public schools in Abuja, Nigeria. Similarly, Nwafor et al. (2022b) and Nwosu et al. (2024) found that ICT facilities in public secondary schools are inadequate. In contrast, the findings differ from those of Atomatofa (2025), who reported no significant difference in the availability of ICT tools across school locations and types.

The findings of the study showed that while public secondary schools use computers in teaching and learning science to a low extent, the private schools use them to a moderate extent. This finding is in agreement with Ololube (2013), who used a sample size from a public school and stated that there are poor ICT resources available for integration, hence the low usage in the secondary school system. Again, the finding is consistent with those of Ademiluy (2019) and Nwosu et al. (2024), who noted that ICT facilities are barely available and grossly inadequate, resulting in their poor utilisation in teaching and learning in public secondary schools.

Also, in line with the findings regarding private schools, Ogunshola (2019) stated that most computer resources are available to some extent but are not properly utilised in the teaching and learning of students in private secondary schools. Similarly, Nwana et al. (2017) posited that computer resources are barely available for teaching and learning in secondary schools. Hence, the majority of the computer facilities needed for teaching are not utilised by the teachers.

The findings of the study showed that the challenges militating against the use of computers in teaching and learning of science students in public and private secondary schools include irregular maintenance of computer equipment or facilities, inadequate electricity supply hinders, lack of funding by the government, lack of internet access, large class size, length of time allocated to science, fear of replacing a damaged computer tool, difficulty in operating computer system, limited knowledge about computer and lack of access to personal computer. These results are consistent with those of Nwafor et al. (2022a) and Davidson and Ezeh (2023), who found that some of the difficulties of ICT application in schools include the use of antiquated computers, a lack of technical support, a lack of time, a lack of computer hardware and software, a lack of electricity, malfunctioning computers, a lack of internet or slow connectivity, and the high cost of computers.

Jacob and Dahir (2021), who identified a number of issues affecting public school students' use of ICT for learning, including insufficient financing for ICT programs, inadequate ICT facilities, subpar internet services, and the high cost of ICT facilities, corroborate this finding. Furthermore, the results of this study are in line with those of Mandina (2015), who discovered that perceived obstacles that keep science teachers from utilising ICT in the classroom include a lack of infrastructure, a lack of ICT competency, a lack of in-service training, and a lack of technical support.

The findings of the study showed that the possible solutions to the challenges facing the use of computers in teaching and learning of science students in public and private secondary school include provision of funds by the government to schools for computer procurement, provision of technical support, proper maintenance and repairs of computer, regular in-service training for computer teachers, provision of access to the internet, provision of enough power supply, granting enough time for teachers and students to practice using computer facilities in the laboratory, making it compulsory for all teachers to take part in computer training, providing enough security to protect computer facilities from theft, internet service providers should grant

schools free internet access for browsing, awarding of personal computers like laptops, tablets to students and teachers to boost learning activities and monitoring computer usage in schools by the government to ensure the effective use of ICT facilities.

These solutions align with the findings of Jacob and Dahir (2021), who pointed out that the provision of high-quality internet services, computer literacy training for students and lecturers, a policy permitting students and lecturers to own a laptop or computer, the provision of sufficient ICT facilities for both private and public secondary schools, and the necessity for the government to lower the cost of ICT facilities in the nation are all necessary to address the obstacles preventing students from using ICT for learning in Nigeria. This study supported the findings of Njoka et al. (2020), who proposed that ongoing teacher in-service training, ICT software upgrades, sufficient security measures for school ICT facilities, and thoughtful government budgetary provisions are the best ways to address the difficulties associated with ICT integration in public secondary schools.

Conclusion

The researchers concluded that most ICT equipment is available in private schools, in contrast to what is obtained in the public schools in Awka Local Government Area of Anambra State, Nigeria. It shows that the available ICT equipment in teaching and learning of sciences in public secondary school include computer, power bank devices e.g. UPS, flash memories, and mouse/keyboard, while for the private schools, computer, scanner, printer, power bank devices e.g. UPS, flash memories, electronic whiteboard (e-whiteboard), computer worksheets, multimedia(MM) projector, e-graphics board, Modems (External/Internal), CD-ROM, audio and video discs, slides for power-point presentations, e-books, graphics software, programmed instruction materials, smartphones and mouse/keyboard were the available ICT equipment for teaching and learning of science.

It was also revealed that computers are used to a low extent in public secondary schools for teaching and learning science, whereas in private schools, they are used to a moderate extent. This research also explored the challenges and solutions facing the use of ICT in teaching and learning of science in public and private secondary schools in Awka South Local Government Area. The challenges identified included poor electricity supply, lack of funds, lack of internet access, large class sizes, and others, and the solution noted was that the government should ensure a regular power supply to enable effective use of ICT resources in secondary schools.

The findings from this study have generated some educational implications, including the need for science teachers to be formally trained in how to apply ICT facilities in the teaching and learning of science, and for them to be provided with training to help them integrate ICT into their teaching and learning of science in the country. Also, better science classrooms, stable internet access and funding are needed to be provided by the government.

Recommendations

Based on the findings of the study, researchers recommended the following:

1. The government should to supply sufficient ICT resources for efficient science instruction and learning.
2. To effectively teach and learn the sciences in both public and private institutions, science teachers should receive training and retraining. Seminars, workshops, and conferences can improve these.
3. The government should provide a steady supply of electricity so that ICT equipment for science education can be used efficiently.
4. Every department in all higher education institutions should have a departmental computer laboratory.
5. To guarantee the upkeep and repair of ICT resources utilised in science teaching, university administrators should hire specialists.
6. Universities should have access to a reliable, free internet connection so as to enable students to utilise the available ICT facilities.
7. Adequate security should be provided by the school administrators to ensure the safety of the available ICT facilities.

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