Multimedia-based instructional delivery practices for interactive teaching and learning in selected secondary schools in Nigeria

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Abstract

Rationale of Study – Despite its numerous benefits, the use of multimedia in teaching and learning in secondary schools in Ijebu North-East Local Government of Ogun state is currently low. Ogun state prides itself on being the education capital of the nation, and to preserve its standing, it is essential to give the education system more attention. Therefore, the study investigated the nature of the problem that caused the low level of multimedia incorporation into teaching and learning.

Methodology – This study used a descriptive survey design with a two-stage sampling strategy. It involved 1850 students, 370 of whom were drawn from four schools. A questionnaire was used for data collection, and results were presented using simple frequency, percentage, mean, and standard deviation.

Findings – The study has established that the interactive multimedia-based resources available were barely sufficient or inadequate and in poor condition, mainly due to a poor maintenance culture. Consequently, they were lowly used, which complicated interactive teaching and learning in secondary schools.

Implications – The low use of the few multimedia resources available for interactive teaching and learning suggests that the government has not invested in multimedia infrastructure. This hinders the full realisation of the benefits of using multimedia resources for interactive teaching and learning in the secondary schools in Ijebu North-East, Ogun State.

Originality – The study distinctly explored the principles of learning by doing and how deep learning occurs using multimedia as instructional delivery tools, aiming to enhance knowledge management in the educational system.

Keywords

Multimedia, knowledge transfer, multimedia technology, interactive teaching

1 Introduction

Teaching and learning are fundamentals in knowledge transfer between teachers and students. Teaching, according to Goodyear (2015), is any activity conducted with the goal of helping somebody to learn. A particular teaching method offers a well-balanced programme of activities and opportunities for students to develop and exercise their latent creative abilities (Ramos, 2015). Hasanova et al. (2021) emphasised that a suitable teaching method considers primarily the abilities, needs, and interests of the learners. More so, a suitable teaching method aims to achieve more significant teaching and learning output.

Learning, on the other hand, is the transformational process by which an individual constructs new knowledge with varying degrees of deliberation (Evans & Kozhevnikov, 2016). Learning occurs through an interactive process rather than by a mere passive observation. As such, a learner needs to feel involved as an active participant during an entire learning process and must be able to negotiate appropriate decisions with the rest of the group and the educator (Evans & Kozhevnikov, 2016).

To be effective, both teaching and learning require a medium. A medium is a channel used to transmit information, enabling people to interact with one another or with the world (Miconi & Serra, 2019). Different media can be employed to convey and receive instruction between teacher and student. Some of these media are chalk and talk, books and computers, slide projectors, video projection, overhead projectors, document cameras, audio systems (a CD player, radio), combined sound and video systems (television, digital video cameras, and DVDs), and other media objects. Due to the nature of instruction and the receiving capacity of the students, different forms of media could be used to deliver instruction. When more than one medium is used as instructional materials in education, it is referred to as multimedia.

Multimedia refers to any computer-delivered integration of text, images, sound, animation and video. Multimedia becomes interactive when the user has control over which elements are delivered. Interactive multimedia transforms into hypermedia when it offers a user-navigable framework of linked elements. Multimedia, therefore, has the combination of multiple technical resources capable of displaying information rendered in multiple formats via multiple sensory channels (Schnotz & Lowe, 2003).

Multimedia allows teachers to achieve a better outcome by integrating text, graphics, animation, and others into a single format to deliver detailed information to students (Crosby & Stelovsky, 1995). More recently, teaching has developed to include multimedia use, such as lecture recordings and online video clips and providing additional kinds of resources, such as websites and databases, to aid effective instructional delivery (Goodyear, 2015). According to Ogunbote and Adesoye (2006), multimedia technology offers a new dimension to learning experiences by making concepts more easier to present and understand when they are complemented with images and animations. Furthermore, it has been demonstrated that learners retain more when they engage a range of senses to process the information and that the intensity of the experience enhances memory by stimulating social, emotional, and intellectual senses. According to Shevchenko (2017), multimedia allows for more interactive, animated demonstrations of complex processes, as well as more natural and apparent interconnections between instructional content and other related topics. Jarosievitz (2011) advocates that universities should leverage the interactivity features of multimedia and their applications for integration in teaching in order to guarantee that pre-service teachers graduate with sufficient knowledge and practical skills.

When teaching practical courses, multimedia might help convey the intended content accurately and comprehensibly. The ability to teach and learn at one's pace makes multimedia resources preferable instructional materials in situations where physical classes cannot be held. A typical circumstance is a national lockdown.

The need for multimedia resources as instructional delivery tools is fundamental in secondary school education. Secondary school is critical in Nigeria because it prepares students for tertiary education and helps lay a solid foundation for higher institutions. After primary school, secondary school is the alma mater for all the erudite and renowned academics. Hence, teachers must leverage the benefits of multimedia resources to provide high-quality education for their students.

2 Research problem statement

The outbreak of the COVID-19 pandemic in 2019, which resulted in the closure of public and private schools across Nigeria in 2020, inspired the Ogun State Government to commence Electronic Visual Learning and Digital classrooms for children of primary and secondary schools across the state dubbed 'OgunDigiClass' in collaboration with the Ministry of Education, Science and Technology. The initiative was to ensure that students continue their learning amidst the unplanned impromptu academic recess. The

instrumentality of multimedia played a crucial role in making this initiative a viable option. This initiative of using multimedia offers students opportunities to learn at their place and pace.

Despite the numerous benefits multimedia offers in teaching and learning, its sustained level of use in secondary schools in Ijebu North-East Local Government of Ogun state is considerably low today. Technical factors, cost of implementation and other comparable challenges constitute factors affecting the incorporation of multimedia into teaching and learning in many secondary schools in Ijebu North-East Local Government of Ogun state. As a result, most of the schools in this area of the state maintain the status quo of using the antiquated 'chalk and talk', face-to-face, and other conventional teaching and learning techniques. This has adversely impacted their ability to leverage multimedia, which is considered a more powerful tool for enhancing learning engagement and creating a visually appealing experience for students. However, little is known about research that focuses on the use of multimedia-based resources for interactive teaching and learning in Nigeria.

Ogun state prides itself as the education capital of the nation, with a desirous continued effort to deepen its legacy with initiatives to improve the teaching and learning environment for teachers and students. To preserve its standing in this regard, the education system must receive more attention in all areas of the state. In order to stimulate creative thinking that will be helpful in addressing the issue, the study tried to investigate the nature of the problem that had caused the level of multimedia incorporation into teaching and learning very low.

3 Research questions

Five research questions have been formulated to guide the study. They are:

   i. What kinds of multimedia resources are available for teaching and learning in selected secondary schools in Ijebu North-Eastern Local Government?

   ii. How adequate are the multimedia resources available for teaching and learning in selected secondary schools in Ijebu North-Eastern Local Government?

   iii. How frequently do students make use of multimedia resources for teaching and learning in selected secondary schools in Ijebu North-Eastern Local Government?

   iv. What are the benefits of multimedia resources in selected secondary schools in Ijebu North-Eastern Local Government?

   v. What are the challenges to multimedia resources in teaching and learning in selected secondary schools within Ijebu North-Eastern Local Government?

4 Review of related literature

The concept of multimedia is viewed in a variety of contexts (Andresen & Van den Brink, 2013). Most definitions agree that multimedia is characterised by the integrated use of text, graphics, animations, video, and sound, as well as the flexibility to present and organise content in a variety of ways. To Babiker (2015), Mukherjee (2018), and Vagg et al. (2020), multimedia can be defined as the delivery and control of text, graphics, sound, animation, and video via a computer. In this context, multimedia becomes interactive when the user has some control over what is displayed.

Mukherjee (2018) defines interactive multimedia as non-linear multimedia, which means any technology that allows the user to control the computer as opposed to the other way around. Such a shift in control enables personalised information flow. These features focus on the user through menu-driven programmes, process simulations, hypermedia applications, performance-dependent programmes, direct manipulation settings, or combinations of any of these interactive elements. This makes multimedia a means of communication and learning that can be used creatively and reflectively (Gunawardhana & Palaniappan, 2016). Educational multimedia applications are classified into four types: Text-based applications, Interactive applications, Web applications, and Mobile (Smart) phone applications (Babiker, 2015).

Each educational application employs a unique method to facilitate a variety of learning experiences and outcomes. Text-based content provides both text and still images in an organised, non-linear learning environment. Students are able to comprehend intricate interrelationships and have control over the pace and content of what appears on the screen owing to multimedia interactive elements in interactive applications. Overall, students have complete control over the learning process. On web applications, different web-based multimedia applications are "uploaded" on servers to deliver helpful knowledge, information, assessment and "know-how" to learners. Mobile multimedia applications such as smartphones, smart cameras, and pads embody some sensing and processing capability with the potential to turn them into smart objects capable of learning and responding on their own or interconnected with other intelligent objects (Ota et al., 2017; Savov et al., 2019; Kivuti, 2021).

The educational goal of multimedia applications is to promote the development process in the context of constructivism, integration of formal and informal activities, integration

of social learning, and flexible delivery, together with an improved pedagogical strategy required for better teaching and learning outcomes (Kapi et al., 2017).

5 An empirical review of the literature

Several works have established how multimedia adds to impactful teaching and learning and the factors that lessen it. Kapi et al. (2017), in an experimental study, examined the efficiency of the methods used for teaching and learning with three distinct multimedia education tools purposely-designed, which are 'Greenfoot as a Teaching Tool in Programming', 'Visualisation makes Array Easy (VAE)' and 'e-Tajweed Yassin' applications. In the e-learning project, students were engaged and allowed to visualise the concept learned, in contrast to the more conventional teaching method. The findings of the research revealed that students had a fresh learning experience, improved their grasp of concepts and performed better in assessments.

Abdulrahaman et al. (2020) carried out an analysis of the various multimedia tools used in the teaching and learning processes in order to find out how multimedia technologies have shown to be an effective means for bridging the gap in the provision of unfettered access to high-quality education and enhancing the performance of learners. Apart from text and images, it was discovered that existing tools have multimedia elements that include audio, animation, video and 3-D. According to the study, the success of the different multimedia tools employed on the different target groups and subjects could be as a result of the technologies and elements embedded in their development.

Vagg et al. (2020) used an online questionnaire for data collection over six months in a study. The findings showed that students had a great experience using technologies such as smartphones and computers. Students were confident in searching for multimedia resources and were exposed to or familiar with multimedia, thereby enhancing their learning experience. Students favoured traditional teaching methods but regarded interactive multimedia as a tool more efficient for practical learning. Students further reported using e-learning tools and 2-D animations more frequently. Thus, the participants recognised the critical role that multimedia plays as an effective teaching tool that may significantly improve and supplement conventional teaching techniques.

Hussain et al. (2022) found that the availability and use of multimedia in Government Higher Secondary Schools in Pakistan were almost the same. Further results revealed an exceptionally substantial association between students' academic accomplishments and

their use of multimedia. Wordu et al. (2022) evaluated multimedia resource availability for enhanced instructional delivery by teachers in Private Secondary Schools in Port-Harcourt Metropolis. The study's findings revealed that computers, printers, access to the Internet, PowerPoint projectors, radio and television sets, educational software, and other resources were available to enhance instructional delivery by teachers to students.

Findings also demonstrated the adequacy of computers, radios, TVs and smartphones for instructional delivery by teachers and that among them, computers, laptops, Internet resources and instructional software were frequently used for delivering instructions. This reveals the impactful strength of interactive multimedia on teaching and learning. In contrast, Bariu (2020) established that most schools studied indicated non-availability of computers and the Internet and where few were available, they were in a poor state. This suggests that teachers and students could not use them during instructional activities. The survey found that, because computer hardware, software, and related accessories were expensive, most schools could not make significant investments in multimedia architecture.

The study of Mavellas et al. (2015), which centred on multimedia resource availability in secondary schools in Zimbabwe, revealed the use level of the resources available and the limiting factors against their optimal use. Among the technologies used for lesson preparation, delivery, and assignments were computers, radios, TVs, networks, wireless technologies, interactive boards, Internet, email, eLearning apps, video conferencing, and projectors. The study indicated that the most significant number of multimedia tools essential for instructional delivery in most secondary schools studied were either completely not available, inadequate or poorly used. Poor electricity, limited resources, technophobia, missing interest, inadequacy of operating skills, high cost of multimedia, and deficient physical infrastructure were cited as problems affecting or impeding the adoption of the limited available resources in the schools. Similar findings by Ondicho (2015) showed that multimedia resources such as overhead projectors, computers and video were rarely utilised in the studied schools for teaching, and this is because they were either not available or accessible or that teachers lacked knowledge and skills for using them. Chalkboards, textbooks, science laboratories, and charts were the most available and frequently utilised media resources in the selected secondary schools.

The teachers' overdependence on chalkboards and class textbooks suggests limited use of available media resources. This could be due to inadequate teacher training in the use of

various media tools. Similarly, in a study by Kurgat (2014), multimedia resources such as television, radio, and computers were found in many schools. However, they were underutilised, owing in part to students' infrequent visits to libraries.

6 Research methodology

A descriptive survey design was adopted for the study, and the population included all public and private secondary schools in Ijebu North-East Local Government. There were fourteen (14) public secondary schools, which had been disarticulated into junior and senior categories, and 15 private secondary schools in Ijebu North-East Local Government. The total population was 1850 students. A two-stage sampling strategy in which stratified and systematic samplings were combined was adopted. A stratified sampling technique was employed to group the population into two strata of public and private schools, and four (4) schools were chosen purposively. Two public schools – Isonyin Grammar School (junior and senior) and two private schools – Luba Comprehensive College (junior and senior). From the sampling frame of 1850, the systemic sampling method was used to select every fifth member at regular intervals drawn from the four schools. This makes a total of 370 students as a sample for the study, considering the confidence level of 95% and margin of error of 5% out of the entire population size from the four selected schools, using Calculator.net.

A validated questionnaire was used to collect data. Its internal consistency strength was tested, and it yielded a Cronbach's Alpha value of 0.71, indicating an acceptable level of reliability. Three hundred and Seventy (370) copies were administered, but 365 (98.6%) were returned and used for the analysis. A simple frequency and percentage table, a measure of central tendency (mean), and a measure of dispersion (Stand Dev) were used to present the results. This is shown in Table 1.

Table 1: Population and sample

Schools	Population	Sample
Isonyin Grammar School, Senior	350	70
Isonyin Grammar School, Junior	451	90
Luba Comprehensive College, Senior	500	100
Luba Comprehensive College, Junior	549	110
Total	**1850**	**370**

7 Results of the study

A total of 370 copies of the questionnaire were administered to students across the selected schools in Ogun State, and 365 (98.6%) were returned and used for the analysis.

7.1 Demographics of respondents

The demographic characteristics of respondents are presented in Table 2.

Table 2: Demographics of respondents

Demographic variables		Frequency	Percent
Gender	Male	149	40.8
	Female	216	59.2
Age bracket	5-10	9	2.5
	11-15	197	54.0
	16-20	153	41.9
	21>	6	1.6
Class Range	JSS 1	41	11.2
	JSS 2	45	12.3
	JSS 3	68	18.6
	SS 1	75	20.5
	SS 2	80	21.9
	SS 3	56	15.3

Table 2 indicated that most of the respondents, 216(59.2%), were female, and 149(40.8%) were male. The majority of respondents, 197(54%), were between 11-15 years, while the fewest, 9(2.5%), were between the age of 5-10 years. Of those in SS 2 who participated in the study, 80(21.9%) were in the majority, while the least were in JSS 1 41(11.2%).

7.2 What kinds of multimedia resources are available for teaching and learning in selected secondary schools in Ijebu North-East Local Government?

Respondents were asked to indicate their level of agreement on multimedia resources available for teaching and learning in their schools. The result is presented in Table 3.

Table 3: Multimedia Resources available for teaching and learning

Kinds of multimedia	SA		A		D		SD		M	S.D
	F	%	F	%	F	%	F	%		
Graphics/Charts are available to visualise concepts.	96	26.3	97	26.6	88	24.1	84	23.0	2.56	1.11
Projected Aids are used in my school to make teaching and learning more engaging and interactive.	93	25.5	98	26.8	86	23.6	88	24.1	2.54	1.12

Tape Recordings are available in my school for self-paced learning.	90	24.7	100	27.4	92	25.2	83	22.7	2.54	1.10
Computers are available for educational use in my school library.	179	49.0	65	17.8	79	21.6	42	11.5	3.04	1.08
Internet is available in my library.	32	8.8	106	29.0	140	38.4	87	23.8	2.23	0.91
Television Broadcast is available in my school for instructional delivery.	57	15.6	54	14.8	148	40.5	106	29.0	2.17	1.02
Videotapes are available in my school library to supplement text-based materials.	41	11.2	71	19.5	47	12.9	206	56.4	1.85	1.09

SA= Strongly Agreed, A=Agreed, D=Disagreed, SD=Strongly Disagreed

Table 3 shows results on the availability of multimedia resources for teaching and learning in the selected secondary schools in Ogun State. There are seven statements to measure the level of agreement on the availability of multimedia resources for teaching and learning on a 4-point Likert scale (Strongly Agree, Agree, Disagree and Strongly Disagree).

The mean value of each item was computed to know the multimedia resources available for teaching and learning summarily. The highest expected mean is 4, while the least expected mean is 1. The mean intervals and their descriptions are as follows: 3.26-4.00 (Very high), 2.51-3.25 (High), 1.76-2.50 (Low), and 1.00-1.75 (Very low). This implies that the closer the mean is to 4, the stronger the level of agreement, and the closer the mean is to 1, the weaker the level of agreement. Based on the data gathered, the most available multimedia resources for teaching and learning include computers ($\bar{x}$=3.04: High); Graphics/Charts ($\bar{x}$=2.56: High); Projected Aids ($\bar{x}$ =2.54: High) and tape recordings ($\bar{x}$=2.54: High), while the least available resource for teaching and learning was videotape ($\bar{x}$=1.85: Low).

7.3 How adequate are the multimedia resources available for teaching and learning in Ijebu North-East Local Government?

Table 4 presents the results on the adequacy of multimedia resources available for teaching and learning.

Table 4: Adequacy of multimedia resources available for teaching and learning

Adequacy of availability	A		MA		I		M	S.D
	F	%	F	%	F	%		
Graphics/Charts	228	62.5	4	1.1	133	36.4	2.26	0.96
Projected Aids	102	27.9	22	6.0	241	66.0	1.62	0.89
Tape Recordings	123	33.7	47	12.9	195	53.4	1.80	0.91
The computer	125	34.2	50	13.7	190	52.1	1.82	0.91
The Internet	150	41.1	54	14.8	161	44.1	1.97	0.92
Television Broadcast	87	23.8	71	19.5	207	56.7	1.67	0.87
Videotape	69	18.9	47	12.9	249	68.2	1.51	0.79

A= Adequate, MA= Moderately Adequate, I=Inadequate

Table 4 contains seven items that were used to measure the adequacy of multimedia resources on three scales: Adequate (2.35-3.00), Moderately Adequate (1.68-2.34) and Inadequate (1.00-1.67). Based on the data gathered, all the listed available items were moderately adequate, while television broadcasts, projected aids, and videotapes were indicated as inadequate (1.00-1.67).

7.4 How frequently do students make use of multimedia resources in teaching and learning in Ijebu North-East Local Government?

Table 5 presents the frequency of use of available multimedia resources for teaching and learning in the selected secondary schools in Ogun State.

Table 5: Frequency of use of multimedia resources for teaching and learning

Frequency of use	D		W		M		O		M	S.D
	F	%	F	%	F	%	F	%		
Graphics/Charts	81	22.2	85	23.3	75	20.5	124	34.0	2.34	1.16
Projected Aids	82	22.5	82	22.5	77	21.1	124	34.0	2.33	1.16
Tape Recordings	78	21.4	81	22.2	79	21.6	127	34.8	2.30	1.18
The computer	160	43.8	46	12.6	76	20.8	83	22.7	2.78	1.23
The Internet	38	10.4	99	27.1	123	33.7	105	28.8	2.19	0.97
Television Broadcast	56	15.3	49	13.4	127	34.8	133	36.4	2.08	1.05
Videotape	32	8.8	57	15.6	25	6.8	251	68.8	1.64	1.04

D=Daily, W= Weekly, M= Monthly, O=Once in a while

Table 5 indicates results on the frequency of use of multimedia resources for teaching and learning. Seven items were used to assess the frequency of multimedia use on a 4-rating scale. The mean range for each scale is Daily (3.26-4.00: Very high), Weekly (2.51-3.25: High), Monthly (1.76-2.50: Low), and Once in a while (1.00-1.75: Very low). The highest expected mean value is 4, while the lowest expected mean is 1. Thus, except for the computers, which have a mean value for the high frequency of use ($\bar{x}$ 2.78), other items

listed have a low mean value for the frequency of use and the lowest for videotape ($\bar{x}$ =1.64).

7.5 What are the benefits of multimedia resources in selected secondary schools in Ijebu North-East Local Government?

Table 6 presents the perceived benefits of multimedia resources use in teaching and learning in the selected secondary schools.

Table 6: Benefits of multimedia resources used for teaching and learning

Benefits of use	SA		A		D		SD		M	S.D
	F	%	F	%	F	%	F	%		
It sustains students' interests.	163	44.7	160	43.8	24	6.6	18	4.9	3.28	0.80
Lessons can be taken at a convenient time and pace	152	41.6	146	40.0	39	10.7	28	7.7	3.16	0.90
It aids understanding of concepts	168	46.0	158	43.3	20	5.5	19	5.2	3.30	0.80
It gives the opportunity to retake the lecture	152	41.6	156	42.7	27	7.4	30	8.2	3.18	0.89

SA= Strongly Agreed, A=Agreed, D=Disagreed, SD=Strongly Disagreed

Table 6 reveals the benefits of the use of multimedia resources for teaching and learning. Four statements were used to measure the perceived benefits of multimedia resources used for teaching and learning on a 4-Likert scale (Strongly Agree, Agree, Disagree and Strongly Disagree). The decision criteria indicate Strongly Agree as 3.26-4.00 (Very high), Agree as 2.51-3.25 (High), Disagree as 1.76-2.50 (Low), and Strongly Disagree as 1.00-1.75 (Very low). Thus, specifically, the mean value yielded very high for the statement "It aids understanding of concepts" ($\bar{x}$ =3.30) and high for others. This means that the use of multimedia for teaching and learning aids understanding of concepts, sustains students' interests, and provides an opportunity for students to retake lessons at their convenience, time, and pace.

7.6 What are the challenges to multimedia resources in teaching and learning in selected secondary schools within Ijebu North-East Local Government?

Table 7 presents the challenges to multimedia resources used in teaching and learning in the selected secondary schools.

Table 7: Challenges to multimedia resources used in teaching and learning

Challenges of use	SA		A		D		SD		M	S.D
	F	%	F	%	F	%	F	%		
The issue of incompetent tutors is a challenge.	68	18.6	74	20.3	113	31.0	110	30.1	2.27	1.09
Lack of awareness	56	15.3	21	5.8	200	54.8	88	24.1	2.12	0.95

There is a problem with the poor maintenance culture.	118	32.3	90	24.7	83	22.7	74	20.3	2.69	1.13
Finance is a constraining factor.	83	22.7	68	18.6	94	25.8	120	32.9	2.31	1.15
Technical know-how is low.	88	24.1	85	23.3	110	30.1	82	22.5	2.49	1.09

SA= Strongly Agreed, A=Agreed, D=Disagreed, SD=Strongly Disagreed

Table 7 shows the challenges of the use of multimedia resources for teaching and learning in the selected secondary schools on a 4-Likert scale of Strongly Agree (3.26-4.00: Very high), Agree (2.51-3.25: High), Disagree (1.76-2.50: Low), and Strongly Disagree (1.00-1.75: Very low). The statement "There is a problem of poor maintenance culture" ($\bar{x}$ =2.69) was considered the most challenging factor in the use of multimedia resources for teaching and learning. In contrast, the mean range for other statements fell low, implying that they were less challenging factors.

8 Discussions

The study investigated multimedia-based instructional delivery practices for interactive teaching and learning in selected secondary schools in Ijebu North-East Local Government, Ogun State. Findings and their implications for practice are discussed in accordance with the research questions set forth to guide the study.

The findings revealed that computer, graphics/charts, projected aids and tape recordings were the most available multimedia resources use for instructional delivery. This is consistent with Wordu et al. (2022), whose study showed that computers, printers, access to the Internet, PowerPoint projectors, radio and television sets, educational software, and other resources were available to enhance the delivery of instruction by teachers to students, in the studied private secondary schools. Meanwhile, the least multimedia resource found to be available for teaching and learning was a videotape. This is not unconnected from the fact that the era of videotape is considered obsolete.

It was also evident from the findings that the available multimedia resources, such as the Internet, computers, tape recordings, and projected aids, were moderately adequate. In contrast, television broadcasts and video tapes were inadequate for teaching and learning in the selected schools. Similar findings by Bariu (2020) established that most schools studied indicated non-availability of computers and the Internet. Where few were available, they were in a poor state due to low investment in multimedia infrastructure. This suggests that teachers and students could not use them during instructional activities in their respective schools. This situation where the most critical listed multimedia resources were either barely enough or not sufficient to meet the teaching and learning requirements of

both the teachers and students is undesirable. Moreover, previous findings by Wordu et al. (2022) demonstrated the impactful strength of interactive multimedia on teaching and learning in secondary schools.

The findings indicated that except for the computers, other items listed, such as graphics/charts, projected aids, tape recordings, Internet, and television broadcasts, have low values for the frequency of use and lowest for videotape. Since most of the resources were either found to be inadequate or barely adequate, consequently, they were infrequently used for teaching and learning. The study of Mavellas et al. (2015) revealed the frequency of use of resources available for training in most secondary schools studied in Zimbabwe. Multimedia resources such as computers, radios, televisions, interactive boards, Internet, eLearning applications, and projectors were either not available or inadequate and utilised infrequently. Similar findings by Ondicho (2015) showed that multimedia resources such as overhead projectors, computers and video were rarely utilised in the studied schools for teaching, and this is because they were either not available or accessible or that teachers lacked knowledge and skills for using them. Chalkboards, textbooks, science laboratories, and charts were the most available and frequently utilised media resources in the selected secondary schools. The teachers' overdependence on the use of chalkboards and class textbooks suggests little use of available media resources. Similarly, in a study by Kurgat (2014), multimedia resources such as television, radio and computers were found in many schools. However, they were also under-utilised partly because students rarely visited the libraries.

The findings disclosed the various perceived benefits of multimedia resources used for instructional delivery in the selected secondary schools. Altogether, multimedia use for teaching and learning aids understanding of concepts, sustains students' interests, and provides an opportunity for students to retake lessons at their convenience, time, and pace. Kapi et al. (2017), in an experimental study, examined the efficacy of the methods used for teaching and learning using three distinct multimedia educational tools purposely designed, in which students were engaged and allowed to visualise the concept learned, in contrast to more conventional teaching methods.

The findings of the study showed that students had a fresh learning experience, improved their grasp of concepts and performed better in assessments. Findings by Vagg et al. (2020) in a recent study equally showed that students' experience while using interactive multimedia was positive. The students also regarded the tool as effective, efficient and

practically engaging. These findings validate the position of Lindstrom (1994) that learners' understanding of a concept is 75% higher when they can see, hear and do simultaneously compared to students who see and hear only (40%) or only see during instruction (20%).

The problem of poor maintenance culture was the most challenging factor for multimedia resources used for teaching and learning in the secondary schools studied. Similar findings by Bariu (2020) indicated that few multimedia resources available in most schools studied were in poor state. The study of Mavellas et al. (2015) also revealed that factors given as limiting the use of few multimedia available were poor electricity, limited resources, technophobia, missing interest, operating skills inadequacy, high cost of multimedia and deficient physical infrastructure. This, according to Bariu (2020), suggests that teachers and students could not use them during instructional activities.

9 Conclusion

The need for multimedia resources to deliver instructions is fundamental in secondary school education. This became more obvious during the surge of the COVID-19 pandemic, which consequently informed the closure of public and private schools across Nigeria. The study has established that multimedia use for interactive teaching and learning aids understanding of concepts, sustains students' interests, and provides opportunities for students to retake lessons at their convenience, time, and pace. However, interactive multimedia resources available were barely sufficient or inadequate and in poor condition, mainly due to poor maintenance culture. Consequently, they were lowly used for interactive teaching and learning. The low use of multimedia available for interactive teaching and learning is suggestive of low investment in multimedia infrastructure by the government. This hinders the full realisation of the benefits of multimedia resources used for interactive teaching and learning in secondary schools in Ijebu North-East, Ogun State.

10 Recommendations

Based on the findings and identified gaps, the following recommendations were offered:

- Ogun state government, through the Ministry of Education, should provide adequate multimedia resources to aid learning and teaching across secondary schools in Ijebu North-East of Ogun State.

- Running costs given to the principals should be increased to enable the schools to get enough funds to procure multimedia resources for the benefit of the students, as inadequate funds were found to be a significant setback in the acquisition of

multimedia resources. Assistance should also be sought from the Old Students' Association, philanthropists and other stakeholders to raise funds to procure adequate multimedia resources.

- The Ministry of Education should properly monitor government schools so that school management can intensify their efforts in managing school resources. This includes cultivating a good maintenance culture and adequately caring for the multimedia resources available to them. The ministry should also encourage the school staff to inculcate the use of multimedia resources.

- Students should be regularly appraised to determine their level of satisfaction with the multimedia resources available to them. This will help the school make necessary adjustments to better serve them.

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