

Effective Integration of Multimedia Resources in Teaching Basic Science in Enugu State: Issues and Affordances

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Abstract

The study investigated the factors militating the effective integration of multimedia in teaching Basic science in Enugu State. Descriptive survey research design was adopted for the study. All thirty-two (32) basic science teachers from all the thirty-one (31) public secondary schools in Nsukka Local Government Area formed the sample for the study. A researcher-developed questionnaire with overall reliability coefficient of 0.97, determined using Cronbach Alpha technique, was used to collect data for the study. Data collected were analysed using Frequency, percentage rating, mean and standard deviation. The results showed that most multimedia resources were not available in the schools and many factors including high cost of multimedia resources, hinder the effective integration of these resources in teaching basic science. From these findings, it was recommended among others that education stakeholders should provide multimedia facilities in schools and put measures in place to ensure that they are integrated in the learning process.

Keywords: Basic science; Multimedia; Teachers

Introduction

Science Education is expected to awaken students' curiosity about the world and foster scientific thinking. The scientific method will help students recognise the nature of science and develop scientific knowledge and science process skills to help them evaluate the impacts of scientific and technological development. This will further prepare students to participate in intelligent discussions on science-related issues and enable them to become life-long learners. Science Education is commonly broken down into the following fields: Biology Education, Chemistry Education, Mathematics Education, Physics Education and Basic Science Education.

Basic Science formerly known as Integrated Science, is an approach to the teaching of science, in which concepts and principles are presented so as to express the fundamental unity of scientific thought and avoid premature or undue stress on the distinction between the various scientific fields (Bajah, 1978). Basic Science is introduced in the early years of primary and secondary education. This subject occupies a very important position in the Nigerian curriculum because it acts as the foundation on which other core science (Physics, Chemistry etc.) are built, and the excellent delivery of this subject's content is very important in helping students develop interest in sciences in the senior secondary school level.

The Federal Republic of Nigeria in its National Policy on Education clearly states that Basic Science is of great importance to the development of an individual student and the nation at large. It also states that Basic Science education shall provide, among others, specific skills for self-reliance and economic

development (FRN, 2013). This means that Basic Science as the foundation of all science subjects, should aim at developing in students, those skills necessary for them to carryout scientific investigations. For those skills to be transferred successfully, the Basic Science teacher must employ a variety of teaching methods and strategies apart from the conventional lecture method which encourages students to be passive in the classroom (Mbonu & Okoli, 2019).

Researchers such as Davies and West (2014) suggested that, low information, literacy level and negative attitude to learning has been found to constitute a serious obstacle to the enhancement of students' learning and are indicators of the necessity for integrating emerging technologies in learning, especially in the field of science. According to Oludipe (2012), Basic Science teachers' use of mostly teacher-centred methods instead of innovative and student-centred teaching methods has continued to hinder greater achievement among Basic Science students. The conventional method is used so much in teaching probably because it allows the teacher to cover large volumes of content in a single lesson and also teach a large number of students at a time but studies have shown that it does not always encourage student active participation in the classroom (Okoli & Mbonu, 2014; Mbonu, 2018; Mbonu-Adigwe et al, 2021). This is because it makes the students passive in the classroom instead of stimulating their senses or exposing the learners to hands-on scientific activities. These teachers' inability to let go of the conventional method and use more of the innovative and student-centred teaching methods in Basic Science teaching may have prevented students from understanding the

subject especially the concepts that appear abstract (Mbonu-Adigwe et al., 2021). There are many innovative teaching strategies some of which include flipped classroom, use of virtual learning platforms, discovery and inquiry methods and the use of multimedia.

Multimedia simply means using more than one medium of expression or communication. In education, multimedia applications are used to improve the learning process and increase teacher-student interaction. Science concepts can be made more interesting by using multimedia applications. Multimedia can help develop collaborative working skills and help students gain knowledge as a team. A multimedia application can highlight certain important points rather than writing on the white boards. There is no doubt that the roles of multimedia applications for educational purposes are too numerous to mention. Multimedia applications can increase learning effectiveness and are usually more attractive than traditional or conventional learning methods (Mbonu, 2018).

In multimedia integrated instruction, concepts are easier to present and understand especially when the words are complemented with images and animations. It adds life to abstract concepts when a number of elements some of which are texts, sound & music, graphics, animations and still pictures are embedded in it. Multimedia is powerful because it tends to appeal to the many senses of the learners. The multimedia integrated instruction when used in teaching science in general and Basic Science in particular will likely lead students to pay more attention in the classroom and lead them on the path of above average academic achievement (Mbonu-Adigwe et al., 2021). Multimedia in this study means the use of ICT materials and facilities in Basic Science teaching.

Even though it has been established that the use of innovative teaching strategies like the use of multimedia in Basic Science teaching is very important, teachers still prefer to employ the conventional lecture method in delivering their science content. It is therefore imperative to find out if there are factors militating against the effective integration of multimedia in the teaching of Basic Science. This is the basis of this study.

Statement of the Problem

The educational system of Nigeria has had a new look since the inception of Basic Science in the junior secondary schools. While the ultimate goal of education is to provide knowledge, in attempt to do this, knowledge has been divided into categories of studies called subjects with science as one of the

elements of the system. Basic Science helps those who may not continue with sciences at a glance or with little knowledge about sciences.

Basic Science as a science subject is facing a lot of problems in terms of teaching and learning which could be linked to methodology used in the teaching of the subject. Lecture methods do not bring science closer to the students, and in this way, many initiatives may not be found within the science community. Even though it is a known fact that the use of multimedia in teaching helps students perform better in Basic Science as recorded by many researchers, most Basic Science teachers still prefer to use the conventional lecture method. It is therefore imperative that we investigate the factors militating against the effective integration of multimedia in teaching and learning of Basic Science in Enugu State and possible solutions to these factors.

Research Questions

The following research questions were posed to guide the study;

1. What are the multimedia facilities available for Basic Science teaching in secondary schools in Enugu state?
2. What are the perceived factors that militate against effective integration of multimedia in teaching of Basic Science?
3. What are the possible solutions to the factors militating against effective integration of multimedia in Basic Science teaching and learning in Enugu state?

Method

The area of the study is Nsukka Local Government Area of Enugu State. The choice of the area was necessitated by the fact that little or no attention has been given to investigating the factors that are militating against effective integration of multimedia in teaching and learning of Basic Science in the Junior Secondary Schools in Nsukka Local Government Area among researchers to the best knowledge of the researcher based on extant literature search.

The population of the study consists of all the thirty-two (32) Basic Science teachers from all the thirty-one (31) public schools in Nsukka Local Government Area. (Post-Primary School Management Board (PPSMB) Nsukka, 2022). The sample of this study was all the thirty-two (32) Basic Science teachers in Nsukka Local Government Area. This implies that there was no sampling since the whole population was used for the study.

Two instruments were used for the data collection: Observation Checklist and Questionnaire. The first instrument is a structured questionnaire titled:

Multimedia Facilities, Challenges and Solutions in Basic Science (MFCSBS), was developed by the researcher for the study. The instrument was made up of two sections (A & B). Section A contains the demographic information of the respondents. Section B is made up of three clusters designed to answer the research questions that guided the study. Cluster A which is an observation checklist is the second instrument used for the data collection. It was used to elicit information on availability of multimedia facilities. Cluster B with twenty-two (22) items was designed to find out the factors militating against effective integration of multimedia in teaching and learning of Basic Science in Enugu State. Cluster C sought to find the possible solutions to the factors militating against effective integration of multimedia in teaching and learning of Basic Science. Clusters B and C were designed on a four-point scale of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) with 4, 3, 2 and 1 weights respectively. The reliability coefficient for clusters B and C were 0.97 and 0.97 respectively. The overall reliability

coefficient of 0.97 was obtained for the instruments using Cronbach Alpha technique. Observation checklist was used to identify the multimedia facilities available for teaching and learning of Basic Science in junior secondary schools in Nsukka Local Government Area of Enugu State and has 25 items. The research questions were analysed using descriptive statistics. Specifically, frequency and percentage were used to answer research question one where the decision regarding any multimedia facility as available was based on the fact that the percentage availability of those facilities was up to 50% or above which is above the cut-off point while mean and standard deviation was used to answer research questions two and three. A mean score of 2.0 and above suggests that the respondents agree with the item while a mean score of < 2.0 suggests otherwise.

Results

The findings of the study are presented in the tables below (Table 1 to 3)

Table 1: Frequency and Percentage of Available Multimedia Facilities for Teaching and Learning Basic Science in Secondary Schools

	Multimedia Facilities	Frequency	Percentage (%)	Remark
1.	Audio Tapes	8	25.0	NAv
2.	E-books	8	25.0	NAv
3.	Projector	23	71.9	Av
4.	Smart Phones	25	78.1	Av
5.	Laptop	19	59.4	Av
6.	Audio Systems & Microphones	24	75.0	Av
7.	Flash Drive	24	75.0	Av
8.	Interactive White Board	0	0.0	NAv
9.	Internet Facility/Network	24	75	Av
10.	Ipad	7	21.9	NAv
11.	CD-ROMs	7	21.9	NAv
12.	Modem	7	21.9	NAv
13.	Digital Library	0	0.0	NAv
14.	Office Softwares	27	84.4	Av
15.	DVD Video Players	22	68.8	Av
16.	Virtual Classroom	0	0.0	NAv
17.	Video Conferencing	0	0.0	NAv
18.	Desktop computer	24	75	Av
19.	Instructional Studios	0	0.0	NAv
20.	Google classroom	0	0.0	NAv
21.	E-journals	0	0.0	NAv
22.	Digital Cameras/Camcorder	2	6.3	NAv
23.	Television	24	75	Av
24.	Radio	26	81.3	Av
25.	Projector Screen	23	71.9	Av

Available = Av and Not Available = NAv

Results in Table 1 shows the availability of multimedia facilities for effective teaching and learning of Basic Science in junior secondary schools in Nsukka local government area of Enugu state.



From the Table, it was discovered that multimedia facilities in items 3, 4, 5, 6, 7, 9, 14, 15, 18, 23-25 were the available multimedia facilities for effective teaching and learning of Basic Science in junior secondary schools in Nsukka local government area of Enugu state. The decision for regarding the 12 multimedia facilities as available was based on the fact that the percentage availability of those facilities

was up to 50% or above which were above the cut-off point. The remaining 13 multimedia facilities which include multimedia facilities in items 1, 2, 8, 10, 11, 12, 13, 16, 17, 19, 20, 21, 22 had their percentage availability below 50% which is below the cut-off point. This indicates that they were not available on the average.

Table 2: Mean Ratings and Standard Deviation of Responses on the Factors Militating Against the Effective Integration of Multimedia Facilities in Teaching and Learning Basic Science

S/N	Item Statement	Mean	SD	Remark
1.	High cost of multimedia facilities	3.50	0.62	A
2.	Wrong choice of software	1.34	0.48	D
3.	Lack of understanding of the value or possible benefits of the use of multimedia facilities	2.25	1.02	A
4.	Students find it difficult to operate	3.50	0.62	A
5.	Inadequate financial support from the government	3.88	0.34	A
6.	Teaching with multimedia could be boring	1.34	0.48	D
7.	Lack of supportive system/infrastructure in the school	1.43	0.49	D
8.	Ability of the students to understand the lesson when being taught with multimedia	1.33	0.51	D
9.	Inadequate time allocated for the period used for teaching with the multimedia facilities	3.75	0.44	A
10.	Lack/Weak internet services	3.69	0.47	A
11.	Lack of confidence by the teacher	1.06	0.25	D
12.	Lack of multimedia facilities	3.84	0.37	A
13.	Phobia of multimedia usage	2.06	0.95	A
14.	Lack of maintenance of the facilities	1.43	0.88	D
15.	Technical issues surrounding the use of multimedia facilities	4.00	0.00	A
16.	Lack of interest by the students	1.09	0.82	D
17.	Lack of in-service training of teachers	3.75	0.44	A
18.	Teacher's belief/readiness to use multimedia facilities	3.31	0.86	A
19.	Some of the facilities takes time to setup	2.22	0.94	A
20.	Power disruptions/Absence of power supply	3.94	0.25	A
21.	Teacher's Motivation/Attitude	2.16	0.88	A
22.	Attitude of students towards the use of multimedia in teaching	2.19	0.90	A

Strongly Agree= SA, A = Agree, Disagree= D, Strongly Disagree= SD

Result in Table 2 shows that all the items 1, 3-5, 9, 10, 12, 13, 15, 17-22 are the factors militating against effective integration of multimedia in teaching and learning of Basic Science in junior secondary schools in Nsukka local government area of Enugu state. The decision for regarding the 15 items as the factors militating against effective integration of multimedia in teaching and learning of Basic Science in junior secondary schools in Nsukka local government area

of Enugu state was based on the fact that all the items had a minimum mean value of 2.0 and above set for decision rule. The Table also revealed that items 2, 6, 7, 8, 11, 14 and 16 which are below the mean value of 2.0 are not factors that militate against effective integration of multimedia in teaching and learning of Basic Science in Nsukka Local Government Area of Enugu state.

Table 3: Mean Ratings and Standard Deviation of Responses on the Possible Solutions to the Factors Militating the Effective Integration of Multimedia Facilities in Teaching Basic Science



S/N	Item Statement	Mean	SD	Remark
1.	Government should provide support by allocating funds to invest in massive internet connectivity in the school	3.81	0.40	A
2.	Government should aim to ensure accessibility, availability and reliability of the multimedia facilities	3.50	0.51	A
3.	Schools should provide security to guide the available multimedia facilities in the school	1.40	0.98	D
4.	Schools can solicit for help from willing individuals, philanthropists and international bodies	3.75	0.44	A
5.	Government can help by subsidizing the tariffs on importation of multimedia facilities	3.72	0.46	A
6.	Experienced multimedia technical staff should be made available	3.97	0.18	A
7.	Classroom teachers should be exposed to series of training and development skills	2.84	0.77	A
8.	Integrating the use of multimedia into the curriculum	3.84	0.37	A
9.	There should be stand-by generators in case of power outage	4.00	0.00	A
10.	Media facilities chosen should be friendly and easy to use	3.59	0.50	A
11.	Teachers should be encouraged to use the available multimedia facilities	3.16	0.63	A
12.	Facilities chosen should not be too expensive	3.28	0.46	A
13.	More time should be allocated to the period for the use of these multimedia facilities	3.81	0.40	A
14.	The use of multimedia in teaching basic science should be encouraged	3.72	0.46	A
15.	Engaging the students especially those who are bored and uninterested	1.43	0.62	D
16.	Students should be allowed to carry out their research and assignments with the aid of multimedia technologies	4.00	0.00	A
17.	Schools should allow multimedia gadgets such as cell phones, laptops, tabs etc inside the classroom to aid learning	3.50	0.57	A
18.	Teachers should be given access to the school's multimedia facilities	3.25	0.72	A
19.	Teachers should be open-minded to new approaches of teaching	3.72	0.46	A
20.	Students should cooperate with the teachers in learning with multimedia facilities	3.44	0.50	A

Strongly Agree= SA, A = Agree, D= Disagree, Strongly Disagree= SD

Result in Table 3 shows that items 1, 2, 4-14, 16-22 are the possible solutions to the factors militating against effective integration of multimedia in teaching and learning Basic Science in Nsukka Local Government Area of Enugu state. The decision for regarding the 18 items as the possible solutions to the factors militating against effective integration of multimedia in teaching and learning of Basic Science

in Nsukka Local Government Area of Enugu State was based on the fact that all the items had a minimum mean value of 2.0 and above set for decision rule. The Table also shows that items 3 and 15 which are below the mean value of 2.0 are not possible solutions to the factors that militate against effective integration of multimedia in teaching and

learning of Basic Science in Nsukka Local Government Area of Enugu state.

Discussion

Multimedia Facilities Available for Teaching and Learning of Basic Science in Secondary Schools

The research findings of the study revealed that only twelve (12) out of twenty-five (25) investigated multimedia facilities were available. These facilities are projectors, smartphones, laptops, audio systems and microphones, flash drives, internet facilities, office software, DVD Video Players, Desktop computers, TV, Radios and projector screen. This implies that there is inadequate availability of multimedia facilities available for effective teaching and learning of Basic Science in junior secondary schools in Nsukka local government area of Enugu state. The finding is in line with Bosan (2012) who found out that there is limited supply of relevant and appropriate Multimedia facilities in Nigeria educational system. Osakwe (2012) concurred to this finding in research question one when he pointed out that while there is a wide range of innovations in multimedia to support effective and quality of delivery of educational services, there is considerable technology lag in Nigerian educational institutions. In other words, the unavailability of majority of these multimedia facilities will invariably affect their integration in teaching and learning of Basic Science.

Factors Militating Against Effective Integration of Multimedia in Teaching and Learning of Basic Science

The findings of the research revealed that, factors militating against effective integration of multimedia in teaching and learning of Basic Science include high cost of living, inadequate financial support from the government, lack/weak internet services, lack of in-service training of teachers, lack of multimedia facilities, among others. This implies that there are factors militating against the effect integration of multimedia in teaching and learning of Basic Science in Nsukka Local Government Area of Enugu state. This finding agrees with Ebeogu (2015), who stated that few available materials are not being used because of inadequate manpower to handle the gadgets. The findings also indicated that the extent to which the available multimedia facilities are used in teaching and learning of Basic Science is very low. There is need for teachers in Nsukka Local Government Area to embrace the use of multimedia in teaching and learning of Basic Science so as to provide opportunities for secondary school students in Basic Science in Nsukka to learn how to use ICT

gadgets, as well as prepare them for life in order to fit into the computerised age.

Possible Solutions to the Factors Militating Against Effective Integration of Multimedia in Teaching and Learning of Basic Science

The findings of the research revealed that, possible solutions to the factors militating against effective integration of multimedia in teaching and learning of Basic Science in Nsukka Local Government Area of Enugu state include that; there is need for government to provide support by allocating funds to invest in massive internet connectivity in the school, there should be stand-by generators in case of power outage, this is as a result of the fact that the success of multimedia facility usage is dependent on electricity supply. Government should also aim at ensuring accessibility, availability and reliability of the multimedia facilities for all secondary schools in Nigeria. It is also necessary to provide experienced multimedia technical staff in schools so as to manage the technical issues surrounding the usage of multimedia. These findings are in line with what Radha (2019) said, for this will encourage them to use these facilities and integrate them in teaching Basic Science so as to blend with changing needs and techniques of education with an objective to develop scientific attitude among the students. In agreement to that, Mbonu and Okoli (2019) recommended that professional training should be provided to equip teachers with the required skills for the use of multimedia in teaching and learning of Basic Science. This training will also help to create awareness on the full benefits of integration of multimedia in teaching and learning of Basic Science.

Conclusion

The study examined the factors militating against effective integration of multimedia in teaching and learning of Basic Science in Nsukka Local Government Area of Enugu state. The following conclusions were drawn based on the findings of the study. Multimedia facilities such as projectors, smartphones, laptops, audio systems and microphones, flash drives, internet facility/network, office software, DVD Video players, desktop computer, TV, radio and projector screen were available for teaching and learning of Basic Science in Nsukka Local Government Area of Enugu state. The study also revealed that the factors that are militating against effective integration of multimedia facilities in teaching and learning Basic Science include; high cost of living, students find it difficult to operate, inadequate financial support from the government, lack/weak internet services, lack of in-

service training of teachers, lack of multimedia facilities, inadequate time allocated for the period used in teaching and learning Basic Science, among others. However, the study concluded that there are possible solutions to these problems which include; Government should aim at ensuring accessibility, availability and reliability of the multimedia facilities for all secondary schools in Nigeria, there is need for providing experienced multimedia technical staff in the schools so as to manage the technical issues surrounding the usage of multimedia, teachers should be given access to the school's multimedia facilities, among others.

Recommendations

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

1. The classroom teacher should be exposed to series of ICT trainings. This can be done by organizing orientations, workshops, seminars and conferences. This can be organized by the PPSMB in Enugu State through adequate sponsorship from the state government.
2. Government should make sure there is constant supply of electricity to secondary schools or standby generator plants as alternative for effective integration of multimedia in teaching Basic Science in case of power failure.
3. Teachers should be allowed access to the available multimedia facilities in the school. This will encourage them to use the facilities in teaching.
4. Curriculum planners should ensure the integration of the use of multimedia facilities in teaching Basic Science. This also will encourage their usage in schools.

References

- Bosan, P. N. (2012). The role of information and communication technology in enhancing students' educational achievement in Nigeria tertiary institutions. *Pankshin Journal of General Studies Education*, 1(2), 1-8.
- Davies, R.S., & West, R.E. (2014). *Technology integration in schools. In handbook of research on educational communications and technology* (4th ed.pp.841-853). Springer New York.
- Ebeogu, U. M. (2015). Information communication technology: A tool for open and distance learning. *Journal of Agriculture and science Education*, 1(2), 561-566.
- FRN (2013). *National Policy on Education*. Printed by NERDC press (6th ed.p). Lagos, Nigeria.
- Mbonu, B. U. & Okoli, J. N. (2014). Teachers' awareness of Strategies for Nurturing creativity in secondary school science, technology and mathematics students in Anambra state in Nigeria. *Journal of the Science Teachers Association of Nigeria*, 49 (1), 187-205.
https://www.researchgate.net/profile/Bianca-Uzoamaka-Mbonu-Adigwe/publication/330754272_Teachers'_awareness_of_strategies_for_nurturing_creativity_in_secondary_school_Science_Technology_and_Mathematics_Students_in_Anambra_state_Nigeria/links/5c52ee68458515a4c74d3a01/Teachers-awareness-of-strategies-for-nurturing-creativity-in-secondary-school-Science-Technology-and-Mathematics-Students-in-Anambra-state-Nigeria.pdf
- Mbonu, B.U. (2018). Comparative Effects of Blended and Non-blended learning strategies on students' achievement in basic science. *African Journal of Science, Technology & Mathematics Education (AJSTME)*, 4 (1), 132-140
https://scholar.google.com/citations?view_op=view_citation&hl=en&user=OHB07m0AAAAJ&authuser=1&citation_for_view=OHB07m0AAAAJ:2osOgNQ5qMEC
- Mbonu, B. U. & Okoli, J. N. (2019). *Effects of Multimedia Integrated Instruction on Students' achievement in Basic Science*. 60th Annual Conference proceedings of the Science Teachers Association of Nigeria (STAN), 229-237
https://www.researchgate.net/publication/333681980_Effects_of_Multimedia_Integrated_Instruction_on_basic_science_students%27_academic_achievement_in_Anambra_state
- Mbonu, B. A., Eya, N. M., Umate, B. A., & Attah, F. (2021). Effects of multimedia integrated instruction on students' acquisition of science process skills in basic science. *African Journal of Science, Technology & Mathematics Education (AJSTME)*, 6 (1), 46-55
https://www.researchgate.net/publication/350690050_Effects_of_Multimedia_Integrated_Instruction_on_Students%27_Acquisition_of_Science_Process_Skills_in_Basic_Science
- Mbonu-Adigwe, B. U., Umate, B. A., Onu, W. O., Ezugwu, I. J., Okebanama, C. I., Okoye, M. N., Ugwuanyi, C.S. & Okeke, C. I. (2021). Assessment of Awareness Level of e-

Learning Classroom Strategies of University Lecturers: Implication for Evaluation of Library and Information Science Resources. *Library Philosophy and Practice (e-journal)*, 6155 (1522-0222).
https://www.researchgate.net/profile/Bianca-Uzoamaka-Mbonu-Adigwe/publication/354803128_Assessment_of_Awareness_Level_of_e-Learning_Classroom_Strategies_of_University_Lecturers_Implication_for_Evaluation_of_Library_and_Information_Science_Resources/links/614f4fce522ef665fb5ec79c/Assessment-of-Awareness-Level-of-e-Learning-Classroom-Strategies-of-University-

[Lecturers-Implication-for-Evaluation-of-Library-and-Information-Science-Resources.pdf](#)

- Oludipe, D.I. (2012). Gender difference in Nigerian Junior Secondary Students' Academic Achievement in Basic Science. *Journal of Educational and Social Research*, (1), 93-97.
- Osakwe, R. N. (2012). *Introduction to Teaching Profession*. Benin City: Ethiope Publishing Cooperation.
- Radha, M. (2019). *Innovative Science teaching for physical science teachers*. PHI learning private limited, Delhi-110092