Multimedia Instructional Materials and Academic Achievement of Integrated Science Students of Federal College of Education, Abeokuta, Ogun State

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Colleges of Education were created to make sure that aspiring teachers had the necessary training and education to work well in the field of education administration after graduation. These outstanding graduates will be tasked with educating school-age children in Nigeria at the primary and junior secondary school levels. The introduction of Multimedia instructional materials into the education sector has improved the teaching-learning process and the academic achievement of students over the years. Unfortunately, not all Colleges of Education have access to or make use of these instructional materials. This study examined the extent to which multimedia instructional materials are made available at the Federal College of Education, Abeokuta and its perceived influence on students' academic achievement. A sample size of 181 male and female 300 level Integrated science students drawn from a population of 331 students participated in the study. A 4-likert scaled questionnaire and an achievement test were the instruments for data collection. Pretest and Post-test achievement tests were carried out before and after available multimedia instructional materials were used during lectures and the Paired Sample T-test was employed to analyze the data. The result showed a significantly positive correlation between the paired variables (r=0.178), a negative t = 19.006 at 180 df and mean = -2.166 at 0.05 level of significance. This means that Multimedia instructional materials does have a positive influence on students' academic achievement, therefore, they must be adequately provided in Colleges of Education.

Keywords: Multimedia Instructional Materials, Integrated Science, Academic Achievement
Word Count*: 238

Introduction

Graduate teachers from Colleges of Education play key roles in the educational growth and development of students since they essentially prepare the students to meet the challenges of senior secondary and university education head-on (Huffmyer& Lemus, 2019). Therefore, students of these colleges need to be equipped with essential knowledge and skills to carry out their future tasks as teachers. The introduction of Multimedia technology into the education sector over the years has positively influenced the academic achievements of students (Youssef, Dahmani & Ragni, 2022). Multimedia instructional materials are all devices, equipment, hardware and software materials or technology used to enhance students' learning outcome or academic success in the teaching and learning process (Anwar, Hasan &Haerani, 2023). Multimedia instructional materials include: 3 Audio: such as radio, recorded tapes

4   Visual: such as images, photographs

5   Audio-visual: such as television, projectors synchronized with audio

6   Software and Applications: such as selfCAD, Prezi

7   Virtual Reality (VR)

8   Augmented Reality

With the aid of technology, teachers can monitor each student's unique learning needs while also allowing pupils to progress at their own rate (Haleem, Juvaid, Qadri & Suman, 2022). Lessons can be customized to the subject matter and the students' varied degrees of background knowledge. Activities that make use of and benefit from multimedia platforms can be used to manage the content of the learning process.

The usage of various multimedia instructional tools in the teaching and learning process has its benefits. Lessons are less tedious, include more learning substance, and are simpler to comprehend. Additionally, there are opportunities for students to work on their own problems in class. Additionally, lecturers might be stimulated and activated to use effective teaching strategies by using multimedia instructional materials.

Statement of the Problem

The apparent low level of academic achievement of Integrated science students from the School of Science, Federal College of Education, Abeokuta, Ogun state has become worrisome for parents and the school administration alike. This situation has been attributed to a number of factors which include poor study habits of students, inadequate provision of multimedia instructional materials, and lack of technical know-how of most of the lecturers on the use of multimedia technology devices for teaching and learning science. Guay and Bureau (2018) found a strong correlation between low academic achievement and low subject-matter motivation among students. Also, Filgona., Sakiyo, Gwany and Okoronka (2020) showed a connection between students' low

academic success and low interest in learning. Mayer (2021) believe that students learn more effectively from words and visuals than from solely words.

A thorough review of literature revealed that there are limited empirical studies on the impact of multimedia instructional materials, including their availability and utilization, on students' academic achievement in Federal Colleges of Education in the country.

Hence, this study aims to add to the body of existing literature by investigating the influence of multimedia instructional materials (availability and utilization of multimedia instructional materials) on the academic achievement of Integrated Science students of Federal College of Education, Abeokuta, Ogun state.

Aim and Objectives of the Study

The aim of this study is to investigate the influence of multimedia instructional materials on the academic achievement of the Integrated Science students of Federal College of Education, Abeokuta, Ogun state. Thespecific aim of this study is to:

1. determine the level of academic achievement of Integrated science students of Federal College of Education, Abeokuta, Ogun state

2. examine the level of multimedia instructional materials that are available to teach students in the School of science, Federal College of Education, Abeokuta, Ogun state

3. examine the relative influence of multimedia instructional materials on the academic achievement of Integrated science students of the School of science, Federal College of Education, Abeokuta, Ogun state

4. examine the combined influence of the School of science lecturers' use of multimedia instructional materials and the availability of multimedia instructional materials on the academic achievement of Integrated science students of School of science, Federal College of Education, Abeokuta, Ogun state.

Research Questions

2 What is the level of academic achievement of Integrated science students of Federal College of Education, Abeokuta, Ogun state?

3 What is the level of multimedia instructional materials that are available to students in the School of science, Federal College of Education, Abeokuta, Ogun state?

Hypotheses

HO_1: There will be no significant relative influence of the multimedia instructional materials on the academic achievement of Integrated science students of the School of science, Federal College of Education, Abeokuta, Ogun state

HO$_2$: There will be no significant combined influence of the School of science lecturers' use of multimedia instructional materials and the availability of multimedia instructional materials on the academic achievement of Integrated science students of School of science, Federal College of Education, Abeokuta, Ogun state

Significance of the Study

This study is significant as it will help to provide a picture of the combined influence of the School of science lecturers' use of multimedia instructional materials and the availability of multimedia instructional materials on the academic achievement of Integrated science students of School of science, Federal College of Education, Abeokuta, Ogun state. This kind of integration could be used to develop more reliable foundations for teaching and learning science.

Theoretical Framework

This study was premised on two theories namely;

Cognitive Theory of Multimedia Learning:

According to Mayer's Cognitive Theory of Multimedia Learning, "words and visuals together provide more learning opportunities than words alone." Mayer and other academics contend that the utilization of visual and aural impacts in multimedia technology stimulates people's brains, facilitating effective learning for internet users. According to research, users who create dual learning channels tend to comprehend and retain information more effectively.

Howard Gardner's Multiple Intelligence Theory:

Instead of defining intelligence as a single, all-encompassing skill, the theory of multiple intelligences suggests that human intelligence be divided into distinct modalities:

Musical-rhythmic and harmonic, Visual-spatial, Linguistic-verbal, Logical-mathematical, Bodily kinesthetic, Interpersonal, Intrapersonal, and Naturalistic intelligences.

Methodology

Population of the Study

The population of the study consists of all the Integrated science students of the School of science, Federal College of Education, Abeokuta, Ogun state. The population of students for the study is 331, comprising of both male and female 300 level Integrated science students. The students at this level were specifically chosen for this study because they have been enrolled in college for a respectable number of years and are presumed to be able to provide pertinent information that could aid in achieving the study's goals.

Sample and Sampling Techniques

In order to construct a statistically meaningful sample for the study, the researcher created precise criteria for sampling both male and female Integrated science students of the School of science, Federal College of Education, Abeokuta, Ogun state. The sample size for the students was determined using Slovin's formula $n = N/(1 + Ne^2)$. The sample for the study was chosen using simple random sampling technique. Since the number of female students (140) is much higher than that of the males (41), all male students were selected in the sample size so as to have a good representation in the study.

Instrument for Data Collection

A self-developed instrument tagged Multimedia Instructional Materials (availability of multimedia instructional materials, perceived effect of multimedia instructional materials on academic achievement) (MIM) and achievement test in Integrated Science Courses (ATISC) was designed for the study to gather the required data from the students.

The instrument is segmented into three sections A, B and C. The demographic information of the respondent, including age, gender, is gathered in Section A. Section B contains items to determine the availability of multimedia instructional materials in the college and how well they are used by Integrated science lecturers during lectures. Section C consists of items to determine the students' perception of the influence of multimedia instructional materials on the academic achievement of Integrated science students of Federal College of Education, Abeokuta, Ogun state.

The achievement test consists of items from all five Integrated science courses taught by School of science lecturers to test the students before and after multimedia instructional materials are included in the lesson plan.

Data Analysis

Achievement Test in Integrated Science Courses (ATISC)

ISC 321 Man and Energy II, ISC 322 Reproduction and Growth, ISC 323 Carbon Compounds II, ISC 324 The Earth and the Moon, and ISC 325 Global Ecology are all courses taken by the 300 level students of School of science, Federal College of Education, Abeokuta, Ogun state which the 181 participants of this study were tested on before and after multimedia instructional materials were used to teach the courses. Five questions were asked for each course, bringing the total number of questions in the achievement test (ATISC) to twenty-five and highest mark obtainable is 100.

The Paired Sample T-test was employed to determine the difference in the pretest and posttest results. The least score obtained for the Pretest is 36 while the highest score is 52. The least score for the Posttest is 48 while the highest score obtained is 76.

RESULTS

Table 4.3.1a Paired Samples Statistics to show differences in pretest and posttest scores

		Mean	N	Standard Deviation
Pair 1	Pretest	2.71	181	.934
	Posttest	4.88	181	1.393

From Table 4.3.1a, the Paired Samples Statistics table, the Pretest Mean is 2.71 with standard deviation .934 while the Posttest Mean 4.88 with standard deviation 1.393.

Table 4.3.1b   Paired Sample Test to show correlation of scores

		Mean	T	Df	Sig 2tailed	Correlation	95%Confidence Interval of the difference	
							Lower	Upper
Pair 1	Pretest Posttest	-2.166	-19.006	180	0.000	.178	-2.391	-1.941

From Table 4.3.1b, the negative Mean value -2.166 show on average, that the Posttest scores is higher than the Pretest scores by -2.166. A negative value is derived because the Posttest was subtracted from the Pretest. Correlation (r) = .178 indicate that the paired variables are significantly positively correlated. The t value -19.006 is the test statistic for this paired t-test with a degree of freedom (df) of 180 at Pvalue0.000 . (t_{180} = -19.006 P< 0.000). The Pvalue 0.000 is <0.05 level of significance at df 180, therefore, since Pv<0.05, df ? 0.

Since the df is not equal to zero, HO_1 would be rejected. The results indicate that multimedia instructional materials have a significant influence on the academic achievement of Integrated science students of the Federal College of Education, Abeokuta, Ogun state who are participants of the study.

S/N	Availability of the following Multimedia Instructional Materials	Mean	StanDev.	Remark
1	Visual Learning Media	2.01	.421	Adequate
2	Audio Learning	3.27	.443	Inadequate

	Media				
3	Audio-Visual Learning Media	1.55	.884	Adequate	
4	Virtual Reality	4.00	.000	Inadequate	for Learning
5	Augmented Reality for Learning	4.00	.000	Inadequate	
6	Interactive Learning Tools	4.00	.000	Inadequate	
7	Overhead Projectors	1.69	.740	Adequate	
8	Soft ware and Applications	4.00	.000	Inadequate	
9	Printed Text for Learning	1.19	.392	Adequate	
10	Tools for Presentation by Staff and Students	1.76	.591	Adequate	
11	Delivery of	3.62	.509	Inadequate	

Science

Materials with
Flipped
Classroom

12	Lectures which include Note-taking and Memorization of Lessons	1.18	.387	Adequate
	Lessons			Inadequate
13	Tools that Facilitate Gamification of the Learning Process	4.00	.000	Inadequate
				Inadequate
		3.71	.522	
14	Accessible WiFi Facilities	3.71	.522	Inadequate
	Weighted Mean	2.86	.349	

Decision Rule: The Weighted mean is 2.86 . Therefore: <2.86 = Adequate instructional materials, >2.86=Inadequate instructional materials.

Table 4.2.3 shows the extent to which the listed multimedia instructional materials are available in the Federal College of Education, Abeokuta, Ogun state. The Weighted Mean is 2.86, therefore according to the decision rule, the multimedia instructional materials that fall before the average mean are deemed adequate while multimedia instructional materials with mean above the weighted mean are deemed inadequate in their availability in the college as stated in table 8 items are in adequate since their mean are greater than 2.86 grand mean. Lectures which include note-taking and memorization of lessons (1.18), Printed texts for learning (1.19), Audio-Visual learning media (1.55), Overhead projectors (1.69), Tools for presentation by staff and students (1.76) and Visual learning media (2.01) all fall below the weighted average mean indicating that these multimedia instructional materials are available in the College of Education at varying levels or degrees. However, improvements can be made in the provision of these instructional materials.

Audio learning media (3.27), Delivery of science materials with flipped classroom (3.62), Accessible WiFi facilities (3.71), Tools that facilitate gamification of learning process (4.00),

Virtual Reality for learning (4.00), Augmented Reality for learning (4.00), Interactive learning tools (4.00), and Software and Applications (4.00) are all inadequate or not available in the Federal College of Education, thus, answering the study's second research question.

For multimedia instructional materials to positively influence the teaching-learning process and the academic achievement of students of Federal college of Education, Abeokuta, adequate provision, use and maintenance of these instructional materials must be the college administration's priority.

Table 4.3.3

Perceived Influence of Multimedia Instructional materials on academic achievement

S/N		Mean	StanDev.	Remark
1	I easily understand the lesson with multimedia instructional materia ls	1.00	.000	High
2	I remember the lessons taught with multimedia instructional materials better	1.04	.206	High
3	I participate more in class activity involving multimedia instructional materials	1.34	.474	High
4	Lectures taught with multimedia instructional material are less boring	1.11	.314	High

5	I am highly motivated to attend lectures	1.08	.276	High
	when multimedia instructional materials would			
	be used			
	Weighted Mean	**1.11**	**.254**	

Decision Rule: The Weighted mean is 1.11. Therefore: 0 -0.99 = Low level of Influence, 1.00-1.99=High level of Influence.

In order to accept or reject the study's second hypothesis, HO_2, Table 4.2.4 which show the perceived level of influence of Multimedia Instructional materials on the academic achievement of students of School of science, Federal College of Education, Abeokuta, Ogun state is reviewed.

Summary of Findings

The results of the pretest and posttest achievement tests conducted on the Integrated science students show an increase in achievement test scores after the use of multimedia instructional materials during the lectures of Integrated science courses. The availability of multimedia instructional materials in the school of science, Federal College of Education, Abeokuta, Ogun state was stated on Table 4.3.2. While some instructional materials were deemed adequate, others were inadequate to influence a higher academic achievement in Integrated science courses. From the items on the instrument of data collection listed on Table 4.3.3, the perceived influence of multimedia instructional materials on academic achievement of the respondents was high.

Conclusion

The study's goal was to examine the influence of multimedia instructional materials on the academic achievement of Integrated science students of the school of science, Federal College of Education, Abeokuta, Ogun state. The Post-test scores of the Integrated science students were higher than the Pretest scores which indicates a positive influence of the usage of multimedia instructional materials on students' academic achievement in Integrated science courses in Federal College of Education, Abeokuta, Ogun state, Nigeria.

Recommendations

The following recommendations were given in light of the study's findings:

1. Students' parents, school administration and the government should ensure the adequate provision of multimedia instrctional materials in the Colleges of Education.

2. The use of these multimedia instructional materials in every lesson by lecturers should be enforced by the school administration.

3. The safety and maintenance of the multimedia instructional materials should be the responsibility of both staff and students alike so as to prolong the life scan of the materials.

4. Regular training and workshop on improving the lecturers' technical skills on multimedia technology and its use should be a priority. A technical support community can also be created for lecturers to enable the interact and share their knowledge amongst themselves and lecturers of other colleges.

5. Staff and students should be encouraged to manufacture multimedia instructional materials which can improve the students' academic achievement. Financial support and every other support needed should be given by the college and government to achieve this.

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