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Multimedia Teaching and Learning Strategies and Students' Academic Performance in Biology in Mkpat Enin Local Government Area

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Abstract
This study examined the influence of multimedia instructional strategy on students' academic performance in biology in senior secondary schools Mkpat Enin local government area (LGA) of Akwa Ibom State. Three specific objectives, three research questions and null hypotheses are stated for the study. Quasi experimental design was used for the study. The population for the study is 978 senior secondary school two (SS II) students in public secondary schools in Mkpat Enin Local Government Area of Akwa Ibom State. The sample consists of 94 SS II students in two intact classes drawn from two selected secondary schools in pat enin LGA. Random sampling technique was used to select the two schools from 13 schools in the study area. The two schools were randomly assigned to treatment and control schools. Data for the study was collected using the researcher developed instrument called Biology Performance Test" (BPT). The instrument developed by the researcher was face and content validated by three experts in the Faculty of Education, Akwa Ibom State University. The reliability coefficient of the instrument was determined using Crombach alpha method. The items were trial-tested on 30 SSS II students in one of the schools in the study area that met the criteria but did not participate in the main study. The result showed reliability co-efficient of .86. Data for the study was collected during the practical sessions of the instruction using the Researcher developed instrument called Biology Performance Test" (BPT). The mean was used to answer all the research questions and t-test was used in testing the research hypotheses at .05 level of significance. Findings of the study reveals that students taught respiratory system using multimedia instructional method outperformed their peers in Expository method. Gender was not significant, thus, Multimedia use in teaching is more attractive and helps students develop positive attitude towards learning biology, thus improving the performance of students. It was recommended that teachers should use multimedia instructional approach to spur students' interest in biology and to teach difficult concepts.

Keywords: Multimedia, Teaching, Learning, Strategies, Performance, Biology

Introduction

Biology is one of the vital science subjects studied in senior secondary schools in Nigeria. Biology as a key science subject refers to the study of plants and animals. The National policy on Education (2013) confirms the importance of biology in Nigeria when it listed biology as one of the core subjects which are compulsory for all science secondary students in

the senior classes. Biology occupies a unique position in the school curriculum; this is because Biology is central to many sciences related professional courses such as Medicine, Pharmacy, Agriculture, Nursing, Biochemistry, Dentistry, Microbiology, Laboratory Technology and all other related courses. It therefore becomes binding on anyone wishing to offer any science or any related to such to offer Biology as one of the prerequisite subjects in the secondary school to gain admission into the University. Though Biology is a prerequisite to these courses, poor achievement in Biology is alarming according to reports from Martins-Omole and Yusuf, (2017) and Ahmed (2018).

Dyel, 2011 observed that in spite of the various innovations introduced into the educational system, the attainment of the desired goals has remained evasive, particularly in the sciences. This under-performance of students in Biology is attributed to many factors such as; the constant use of the lecture method of teaching and other teaching methods not suitable for a subject that has a string link to the environment. The purpose of biology learning in schools is to generate and strengthen students' attitudes, provide scientific knowledge and equip them with relevant skills, so they are able to solve the problems in daily life as a citizen (Sulaeman, 2018). Through appropriate biological learning processes, students can grow their awareness of the complexity of biodiversity and bioprocess, the application of biology, as well as the sensitivity and awareness to environmental issues, take care of the environment as manifestation of their attitudes (Khatoon et al., 2014). In addition, students can be more aware that the science and technology they are learning is beneficial to individuals, communities, and the environment. It also helps to broaden their perspective on environmental conservation (Badri, et al., 2016).

It is obvious that Biology has its underpinnings in the environment and any effective instructional method applied to teach Biology should be able to replicate the environment in the classroom. It should also appeal to the senses. Thus, Biology as a subject is best taught using realia. An appropriate teaching method would be Multimedia instructional strategy among others. Multimedia is defined as an integration of multiple media elements (audio, video, graphic, text animation among others) into one strong and symbiotic whole that results in more benefits for the end user than any of the media element can provide individually (Bello, et al, 2020). Umar, Ossom and Egbita (2020) asserted that multimedia are instructional materials and interactive application that integrate text, color, graphic images, audio, animation, audio sound, and full motion video in a single application. Salisu (2015) opined that multimedia approach can be used in teaching subjects like Geography, Biology, Chemistry, Physics, and Mathematics among others. A multimedia aided instruction engaged students‟ interest, and encouraged them to collaborate, to inquire and to explore effectively, far beyond the bounds of the school (Galope, 2013).Research has shown that people remember 20% of what they see, 40% of what they see and hear, but about 75% of what they see and hear and do simultaneously (Krishnasamy, 2016). With multimedia, the communication of information can be done in a more effective manner and it can be an effective instructional medium for

delivering information. According to Chapman (2013), the use of multimedia in teaching and learning processes has the potential to improve instruction by creating a technology-based, student-centered learning environment that allows students to take charge of their own learning. Using multimedia in classroom provides students with suitable learning resources according to their learning

Multimedia is one of the best educational techniques because it addresses more than one sense simultaneously, as it addresses the senses of sight & hearing. Multimedia programs provide different stimuli in their presentations which include a number of elements some of which are Texts, spoken words, sound & music, graphics, animations and still pictures. These elements were mainstreamed in a comprehensive presentation so as to provide effective education, which in turn will support the participation of the different senses of the learners in diverse syllabi. (Aloraini, 2012).

Every instruction is judged based on the effect on academic achievement and retention of students. Achievement according to Umar et al (2020) is the scholastic standing of a student at a given moment. It has to do with the successful accomplishment of goal(s). The purpose of testing an achievement is to help the teacher and the students evaluate and estimate the degree of success attained in learning a given concept. It is also useful in testing the retention of information and skill. It is equally appropriate in determining the efficiency of instruction. One of the issues at stake in education today is students‟ achievement measure in relation to teaching and the overall success of learning outcome, Use of place-based learning teaching method in teaching simple machine by basic science and technology teachers may make Basic science and technology lesson objective stimulating and interesting to the students Retention which is an ability to remember or recognize the content that has been learned or experienced is an importance issue in teaching and learning. Learning is complete when knowledge can be transferred into a new situation. The need to have varied practice tools is to facilitate transfer and enhance retention process. Studies on types of learning tools that promote students‟ retention is yet to be concluded. For instance, Shieh & Yu (2016) revealed that guided discovery instruction influenced learning retention.

Nowadays, it is obvious that technological developments have resulted into new ways by which students collect educative information/material especially via multimedia package. Therefore, it is highly necessary to introduce the new technological tool into teaching and learning Biology. Hence the application of Multimedia technology in teaching and learning biology in Secondary Schools has the tendency to increase students' academic achievement. This study thus, investigates the application of multimedia technology in teaching biology among senior secondary school students.

Statement of the Problem

Instructional methods and instructional delivery techniques are essential factors influencing the learning achievement of students. While instructional methods are likely to enhance learning achievement, inappropriate Instructional approaches can stifle knowledge retention and realization of learning objectives. It is however unfortunate that instruction in biology has remained teacher centred, allowing only the teacher to be the source of knowledge

and whatever s/he cannot show, students cannot learn. This contradicts the tenets of teaching biology being a subject that relies greatly on what can be seen in the environment. Most teacher still prefer using the chalk and talk method instructing learners although Multimedia could facilitate meaningful learning in Biology and this method is considered a good strategy for improving cognition. Multimedia instruction not only appeals to the senses of students, but it is also an effective way of instructional delivery technique aside being an effective instructional method. failure by teachers to explore the use of multimedia instructional strategy in biology is leading to teaching biology concepts that can be seen and felt as being abstract, thereby making learning and comprehension abstract and difficult. A number of empirical studies have investigated the link between Instructive Multimedia used in subjects such as Mathematics, Physics and other sciences, but not much investigation has been done on the linkage of Instructional Multimedia and learning achievement in biology in Secondary Schools. The above situations informed the need for this study aimed at investigating such issue pertinent to the effect of Instructional Multimedia in biology. The problem of the study put in question form; what is the impact of multimedia instructional strategies on students‟ achievement and retention in Biology in Mkpat Enin local government area of Akwa Ibom State?

Purpose of the Study

The main purpose of this study was to determine the influence of multimedia instructional strategy on students' academic performance in biology in senior secondary schools Mkpat Enin local government area (LGA). The Specific objectives were to:

1. Determine the difference in mean academic performance of students in respiratory system when taught using multimedia instructional strategy and expository method in senior secondary schools in Mkpat Enin LGA.
2. Determine how student interest influence mean academic performance in respiratory system when taught using multimedia instructional strategy.
3. Determine the difference in male and female students academic performance in respiratory system when taught using multimedia instructional strategy in Mkpat Enin LGA.

Research Questions

The following research questions are stated for the study

1. What is the difference in mean academic performance of students in respiratory system when taught using multimedia instructional strategy and expository method in senior secondary schools in Mkpat Enin LGA?
2. How does student interest influence mean academic performance in respiratory system when taught using multimedia instructional strategy?
3. What is the difference in male and female students' mean academic performance in respiratory system when taught using multimedia instructional strategy?

Research Hypotheses

The following hypotheses were tested at .05 level of significance

Ho_1: There is no significant difference in mean academic performance of students in respiratory system when taught using multimedia instructional strategy and expository method in senior secondary schools in Mkpat Enin LGA.
Ho_2: There is no significant influence of interest on the mean academic performance of students in respiratory system when taught using multimedia instructional strategy instructional strategy.
Ho_3: There is no significant difference in male and female students' mean academic performance in respiratory system when taught using multimedia instructional strategy in senior secondary schools in Mkpat Enin LGA.

Theoretical Framework

The study adopts and discusses the Bale Brunerian core of experience theory (1946). Edger Bale (1946) constructed and developed from his experience in teaching and the observation of learners the starts actual experiences. According to the theory, the core experience starts with the learner as a participant in the actual experience, then moves to the learners as an observer of the actual event. Then to the learner as an observer of a mediator event (an event presented through some medium) and finally to the leaner as an observer of symbols that represent an events. Bale contended that learners could make profitable use of more abstract instructional activities to the extent that they had built up a stock of more concrete experiences to give meaning to the more abstract representation of reality. This situation re-emphasizes the use of concrete materials at the secondary level of Education; learning is more effective when it is done with concrete materials. Bale (1946) realizing the importance of audio visuals in teaching using the core of experience suggest that the values of audio visual are the accurate representation of complex relationship, a practical guide to analyzing the characteristics of instructional material and how the academic achievement of Biology students.

The implication of this theory to this regard is that, it shows that students learn better and faster with concretes materials than other methods like realization. As students interact with instructional materials, learning becomes interesting and quiet understandable. Therefore the theory suggest that for learning to take place easily and smoothly at the secondary level of education, the use of material instructional aids or materials is inevitable. Hence, computer science teachers must as a matter of necessity us instructional materials at the level of education to the students if proper learning must take place.

Concept of Multimedia

Multimedia has been defined in several ways by different educators but basically, they all seem to be saying the same thing. Common to all is the fact that Multimedia involves the combination of various digital types such as text, sound, video to disseminate information for better understanding of audience. Alberk (2011) view multimedia as the exciting combination

of computer hardware and software that allows one to integrate video, animation, audio graphics and text resources to develop effective presentation to an affordable desktop computer. Ashley (2013) opines that multimedia is characterized by the presence of text, pictures, animation and video, some or all of which are organized into some colorant programme. However, today's multimedia is a carefully crafted combination of text, graphic, sound animation and video elements among others that allow for the benefit of the end user. Where the viewer of a multimedia project has to control on 'What?', 'When?' and 'How?' the elements (learning materials) are presented, it is referred to as interactive multimedia (Berk, 2018).

Some of the advantages of multimedia as identified by Aloraini, (2015) are:

1. They make the reading process a dynamic one instead of the written presentation of the texts printed in the book.
2. Presenting different drawings and pictures supports the clarification of ideas and communication of information.
3. Moving easily from a presented subject to another provides a good chance for questions and discussions.
4. Using different presentations like video clips along with maps or other kinds of presentations help to get the information closer to reality. Adding music makes the idea clearer and it attracts the attention of the learners (Aloraini, 2015)
5. They rise the attention and interaction between students and the educational subject.

Multimedia provides easiness and facilities in education. Ilhan and Oruç (2016) states The use of multimedia possesses the aim of helping students with different skills and learning styles. Also, multimedia provide the opportunity for every student to work individually. In other words, a student can work on the subject(s) she/he believes she/he needs to in the way she/he desires (Ilhan & Oruç, 2016). Also, it can be observed that multimedia gains authenticity and variety in learning and instruction. Yünkül and Er (2014) expressed the fact that the message via multimedia reaches the receivers in various ways and thus, it provides a richer learning environment. The subjects being taught could be transmitted to the students with web-based audio, visuals, video and animations in a way that could not be taught in classrooms authentically with other techniques. This way, closeness to reality could be provided and complete learning could be achieved (Yünkül & Er,2014).

From the literature, it could be asserted that multimedia use eases and objectifies learning as it presents more than one technological factor to the learner and it addresses more than one emotion of the receiver.

Teaching Biology using Multimedia Technology

Biology is a science subject which explains the existence of life. It is a natural science which is concerned with the study of living organisms, their structures, forms and functions,

heredity, etc. It is a fundamental science subject which serves as tile basis for understanding the complexities of how the body parts of organisms' function. Biology according to Taiwo and Emeke (2014) the subject exposes the students to the world of knowledge of self, the immediate and distant environment. This may be the bases for its inclusion in the Senior Secondary School (SSS) curriculum in Nigeria. The objectives of teaching Biology in the SSS in Nigeria include adequate laboratory and field skills in biology; meaningful and relevant knowledge in Biology; ability to apply scientific knowledge to everyday life in matters of personal and community health and agriculture (FME, 2013).

Despite the importance of the teaching of Biology in senior secondary schools, in the development of individuals, studies (WAEC, 2011; Taiwo & Emeke, 2014) report consistent poor performance of students at the internal and external examinations. However, the reports have showed that the major cause of poor performance of students to science subjects to be the prevailing method of teaching in science classroom in Nigeria (Ukoh & Adewale, 2014). Since the current teaching strategies commonly used for teaching science have failed to enhance problem-solving skills, curiosity and critical and logical thinking among the science students (Shan & Khan, 2015), there is a great demand to shift to technology integration strategies as a new form of pedagogy. Most especially paradigm shift of integration of instructional strategies that appeal to the senses and integrate technology in the teaching and learning process. A suitable instructional technique would be the multimedia instructional strategy. Buttressing this view, Neo (2017) averred that multimedia is characterized by the presence of texts, pictures, sound, animation and video; some or all of which are organized into a coherent program. From the definitions, it could be deduced that multimedia involves communication or presentation of information through multiple channels. Some or all of these elements (sound, animation, text, audio, image, graphic, video, etc) could be combined and used in biology classroom for teaching process. The multisensory nature of multimedia makes it to stimulate multiple senses of the audience at a time. If applied in biology classroom, it could stimulate students' senses in the classroom and allow interaction between the students and teachers. These could make teaching biology more attractive and interesting to students and as well enhance students' motivation and understanding thereby making learning meaningful and authentic. This is supported by Sousa, Richter & Nel (2017) assertion that multimedia elements have paramount importance in teaching of science since it helps to present different phenomenon and process vividly, simulate complex contents and present different levels of abstraction. Thus, some concepts which appeared abstract to students may become clearer and better retained. This may have positive effects on students' academic achievement and attitude to learning of the subject. However, with the level of technological development and integration in education globally, the use of multimedia in teaching biology in secondary school in Nigeria has not been successive.

Multimedia Instructional Strategy and Students' Interest

When student's interest increases, understanding becomes enhanced and retention ability increased (Gilakjani, 2012), there is tendency for an improvement in academic achievement and attitude. This is in accordance with Shah and Khan (2015) remark that power point presentation in teaching science improves student's attitude towards science. Renninger and Hidi (2002) differentiate between two forms of student interest, defining it as ‘‘a psychological state of having an affective reaction to and focused attention for particular content and” or the relatively enduring predisposition to re-engage particular classes of objects, events, or ideas’’ (p. 174). According to Hidi and Renninger (2006), interest is distinguished from other motivational variables in that interest is the outcome of an interaction between an individual and a particular content. This content has both an affective and cognitive effect on an individual. Interest has been found to have a powerful influence on student learning, with greater interest leading to greater persistence, intrinsic motivation, levels of learning and academic achievement (Rotgans & Schmidt, 2011). A number of studies have been done that positively correlate student interest with academic performance. Several of the examples that support this idea are based specifically on interest in literature, although some studies can be generalized across content areas(Ofem, 2015).

Review of Related Empirical Studies

Umar et al (2020) compared the impact of multimedia instructional strategies on students’ achievement and retention in basic science and technology in junior secondary schools in Niger State. A sample of one hundred and two (102) JSSII students was involved in the study. The design of this study was quasi-experimental research design as there was no randomization of subjects into classes. Intact classes were used. Research questions were answered using mean and standard deviation while Analysis of Covariance (ANCOVA) was used in testing the hypotheses at 0.05 level of significant. Results from the study revealed that students who were taught basic science and technology using multimedia instructional strategies achieved and retained higher than those taught without instructional strategies. The study equally revealed no significant difference in the mean achievement and retention scores of male and female students.

Bello, et al (2020) investigated the impact of multimedia-enriched lecture method on academic performance of secondary school students in Physics in Kano Metropolis Nigeria.. A Quasi-experimental Pretest, Posttest, Research Design was used. The population of the study consisted of 13650 SSII students of public secondary schools in Kano State. Four schools were randomly sampled consisting of 240 students with sixty students in their intact classes participated in this study. Findings reveal that (i) there was a difference in academic performance between students exposed to multimedia-enriched lecture method and those exposed to conventional lecture method. The mean difference between the two groups being 1.06 which is small, showing that gender does not affect performance very much when they

taught Physics using Multimedia-enriched lecture method. This implies that the teaching approach was gender friendly.

Sauer (2012) studied the Impact of Student Interest and Instructor Effectiveness on Student Performance. This research project began by asking if and how student interest and instructor effectiveness impacted student performance. Research was conducted with two middle school students. The data was gathered by administering questionnaires, collecting student work, and recording observations. Findings revealed that students' interest and their relationship with the instructor were contributing factors in successful academic performance. Therefore, the data implied that teachers need consider student interest and develop a relationship with them in order to foster student growth and success.

Methodology

`A quasi-experimental design using the pre-test, post-test control group method was employed for the study. The area of the study is Mkpat Enin Local government area of Akwa Ibom State. The population is 978 students. The population of the study comprised all Senior secondary school students in SS II in the 13 public secondary schools in Mkpat Enin LGA in Akwa Ibom State (Akwa Ibom State Secondary Education Schools Board, 2021). The sample consists of 94 Senior secondary II (SSII) students in two (2) intact classes drawn from two selected public secondary schools, with each classe representing control and experimental groups respectively. Stratified Random sampling technique was used to select the two schools from 18 schools in the study area and also to ensure that male and female students were involved in the study. The researcher developed instructional packages (lesson Plans) based on the same objectives for both multimedia and expository instructional methods respectively. Data for the study was collected using the researcher developed instrument called "Biology Performance Test" (BPT). The instrument was made up of 10 items and was used to assess the academic performance of the students. The instrument developed by the researcher was face and content validated by three experts in the Faculty of Education. One expert in the area of Test and Measurement and two experts in the Department of science Education, Akwa Ibom State University, were involved in the validation process. While the Tests and Measurement expert assessed the materials in terms of difficulty level, experts in science Education assessed it in terms of appropriateness of material to the constructs under study. The observed corrections and inputs from the experts were incorporated into the instrument. The reliability coefficient of the instrument was determined using Crombach alpha method. The items were trial-tested on 30 SS II students in one of the schools in the study area that met the criteria but did not participate in the main study. The result showed reliability co-efficient of .86. On the basis of the high reliability index, the instrument was deemed suitable to be used in conducting the study.

Data for the study was collected during the practical sessions of the instruction using the Researcher developed instrument titled Biology Performance Test" (BPT).The data generated was analyzed using mean, standard deviation and t-test. The mean was used to answer all the research questions and t-test was used in testing the research hypotheses at .05 level of significance.

Presentation of Findings

Research Question 1: What is the difference in mean academic performance of students in respiratory system when taught using multimedia instructional strategy and expository method in senior secondary schools in Mkpat Enin LGA?

Table 1: Mean gain scores of Students Taught Respiratory system with multimedia instructional strategy and Expository Method

Teaching method		Pretest	Postest	Mean gain Posttest-Pretest)
Multimedia Instruction	Mean	6.09	18.69	12.6
	N	45	45	
	Std. Deviation	1.94	2.97	
Expository	Mean	7.34	12.25	4.91
	N	47	47	
	Std. Deviation	1.57	3.31	

Table 1 reveals that the mean gain score of students taught with Multimedia (12.6) is greater than the mean gain score of students taught with Expository Method (4.91). This implies that Multimedia instructional strategy has a greater effect on students' performance in respiratory system than Expository Method.

Research Question 2: How does student interest influence mean academic performance in respiratory system when taught using multimedia instructional strategy?

Table 2: Mean gain scores of Students Taught respiratory system with multimedia and Expository methods based on students' interests

Interest level		Pretest	Postetest	Mean gain Posttest-Pretest)
High interest students	Mean	7.35	18.56	11.21
	N	29	29	
	Std. Dev.	1.53	3.41	
low interest students	Mean	7.68	17.59	9.91
	N	16	16	
	Std. Dev.	1.01	2.97	

Table 2 reveals that the mean gain score of students taught with multimedia instructional strategy based on students level of interest. The result shows that students with high interest in multimedia had mean gain of 11.21 which is greater than the mean gain score of students with low interest (9.91). This implies that interest level of students' influences performance of students in multimedia instruction. The result also shows that there is high interest in multimedia instruction, given the number of students with high interest in multimedia (29).

Research Question 3: What is the difference in male and female students' mean academic performance in respiratory system when taught using multimedia instructional strategy?

Table 3: Mean scores of Male and Female Students Taught respiratory system with multimedia instructional methods

Gender		Pretest	Postetest	Mean gain Posttest-Pretest)
Female	Mean	7.57	17.70	10.13
	N	23	23	
	SD	1.32	3.50	
Male	Mean	7.38	19.04	11.66
	N	22	22	
	SD	1.25	2.12	

Table 3 shows the summary of male and female students scores in respiratory system test when exposed to multimedia instructional strategy. The result indicates that male students had a mean gain of 11.66 and the female students had a mean gain of 10.13. The result shows

that Male students performed slightly better than their female counterparts in Biology using multimedia instructional strategy.

Research Hypotheses

Ho_1: There is no significant difference in mean academic performance of students in respiratory system when taught using multimedia instructional strategy and expository method in senior secondary schools in Mkpat Enin LGA.

Table 4: Summary of t-test for Significant difference in mean academic performance of students in respiratory system when taught using multimedia instructional strategy and expository method

Teaching method	Mean gain Posttest-Pretest)	Std. Dev	df	tcal	Prob. Of t	decision
Multimedia	12.60	2.97				
Expository	4.91	3.31	92	5.004	.001	Reject Ho

**= significant at P<.05 alpha level*

Table 4 shows the t-test analysis summary of students' performance when taught respiratory system using multimedia and expository methods. The table indicates that the calculated t-value is 5.004 with the significant of t at .001. This means that, at P< .5, the null hypothesis is significant. Therefore, the null hypothesis is rejected and the alternate hypothesis is upheld. This implies that, there is a significant difference in mean academic performance of students in respiratory system when taught using multimedia instructional strategy and expository method in senior secondary schools in Mkpat Enin LGA, with students in the multimedia class performing better than students in the expository class.

Ho_2: There is no significant influence of interest on the mean academic performance of students in respiratory system when taught using multimedia instructional strategy instructional strategy.

Table 5: Summary of t-test analysis for significant influence of interest on students' performance in respiratory system taught with multimedia strategy

Interest level	Mean gain Posttest-Pretest	Std. Dev	df	tcal	Prob. Of t	decision
High interest	11.21	3.41				
low interest	9.91	2.97	92	3.017	.003	Reject Ho

**= significant at P<.05 alpha level*

Table 5 shows the t-test analysis summary of students' performance when taught respiratory system using multimedia base on their interest level. The table indicates that the calculated t-value is 3.017 with the significant of t at .003. This means that, at P< .5, the null hypothesis is significant. Therefore, the null hypothesis is rejected and the alternate hypothesis is upheld. This implies that, there is a significant influence of interest on the mean academic performance of students in respiratory system when taught using multimedia instructional strategy instructional strategy, with students with high interest in multimedia performing better than students in the low interest.

Ho$_3$: There is no significant difference in male and female students' mean academic performance in respiratory system when taught using multimedia instructional strategy in senior secondary schools in Mkpat Enin LGA.

Table 6: Summary of t-test Analysis for Significant effect of gender on students' performance in respiratory system when taught using multimedia

	Gender	N	Mean gain Posttest-Pretest	SD	df	tcal	Prob. Of t	decision
Multimedia	Female	23	10.13	3.50	45	1.123	.315	Accept Ho
	Male	22	11.66	2.12				

**= not significant at P > .05 alpha level*

Table 6 shows the t-test Analysis of male and female students' performance in respiratory system when taught using multimedia. The table indicates that the calculated t-value of 1.123. The probability value (.315) is greater than the significant value (0.05) at P<.05. This implies that the null hypothesis is not significant. Therefore the null hypothesis is retained. This implies that, there is no significant difference in male and female students' mean academic performance in respiratory system when taught using multimedia instructional strategy in senior secondary schools in Mkpat Enin LGA.

Discussion of Findings

Result of analysis shows that the mean gain score of students taught with Multimedia (12.6) is greater than the mean gain score of students taught with Expository Method (4.91). This implies that Multimedia instructional strategy has a greater effect on students' performance in respiratory system than Expository Method. The hypothesis test confirms that there is a significant difference in mean academic performance of students in respiratory system when taught using multimedia instructional strategy and expository method. This finding is in agreement with Bello, etal (2020) who investigated the impact of multimedia-enriched lecture method on academic performance of secondary school students in Physics in Kano Metropolis Nigeria. The study found that there was a difference in academic performance between students exposed to multimedia-enriched lecture method and those exposed to conventional lecture method.

Analysis of the research question indicates that the students with high interest in multimedia had mean gain of 11.21 which is greater than the mean gain score of students with low interest (9.91). This implies that interest level of students' influences performance of students in multimedia instruction. The related hypothesis test indicates that there is a significant influence of interest on the mean academic performance of students in respiratory system when taught using multimedia instructional strategy instructional strategy, with students with high interest in multimedia performing better than students in the low interest. This finding is in line with Sauer (2012) studied the Impact of Student Interest and Instructor Effectiveness on Student Performance. the studies found that student interest in multimedia and technology enabled teaching enhances academic performance.

Findings from the research question shows that male students had a mean gain of 11.66 and the female students had a mean gain of 10.13. The result shows that Male students performed slightly better than their female counterparts in Biology using multimedia instructional strategy. The hypothesis test however, shows that there is no significant difference in male and female students' mean academic performance in respiratory system when taught using multimedia instructional strategy in senior secondary schools in Mkpat Enin LGA. This implies that multimedia enhances performance of both male and female students. This finding is supported by Bello, et al (2020) who found no significant difference in performance based on gender of students.

Conclusion

Based on the findings of the study, it is concluded that students taught respiratory system using multimedia instructional method outperformed their peers in Expository method and also retained more taught content. Male and female students performed well in respiratory system when taught using multimedia instructional strategy, as such, the method helps to compensate for any gender difference in teaching sciences. Multimedia use in teaching is more

attractive and helps students develop positive attitude towards learning biology, thus improving the performance of students.

Recommendations

Based on the findings of the study, the following recommendations are made

1. Biology is a subject that is best explained with diagrams and models, as such, teachers should be encouraged to incorporate instructional graphics and multimedia in the teaching of biology concepts.

2. Teachers should use multimedia instructional approach to spur students' interest in biology and to teach difficult concepts.

3. Expansion in using multimedia in teaching other theoretical curriculums and stressing the use of computer as an educational tool in teaching.

4. Also, teacher education programmes in Nigerian tertiary institutions should be improved upon to prepare trainee teachers who can apply innovative approaches (multimedia instructional strategies) that will promote effective teaching and learning.

5. Also, instructional designers and instructional material developers should develop relevant multi-media instructional packages for use within the Nigerian school systems.

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