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Effect of Audio-Visual Materials on Senior Secondary School Students' Interest in Chemistry in Agbani Education Zone Enugu State.

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ABSTRACT

This study investigated the effect of Audio-Visual Materials(AVM) on senior secondary school students' interest in chemistry in Agbani Education zone of Enugu State. Two research questions and two null hypotheses guided the study. A Quasi-Experimental Non-equivalent Control Group Design was adopted for the study. A sample of 148 SS II chemistry students, drawn by both purposive and simple random sampling techniques from two co-educational schools in Enugu South Local government Area of Agbani Education zone was used for the study. The two schools were assigned to experimental and control groups. Two intact classes in each school were randomly assigned one to experimental and the other to control group. The two experimental groups were taught using AVM and lecture method while the control groups were taught using the lecture method only. The instrument for data collection was the Chemistry Interest Scale (CIS) which was developed by the researcher. The null hypotheses were tested at (P < 0.05) using analysis of covariance (ANCOVA). The result of data analysis showed a significant difference between the mean interest scores of SS2 students taught using AVM and lecture and their counterparts taught without AVM, there is a significant difference in the mean interest scores of males and females taught using AVM and lecture with the female students showing more interest than their female counterparts. Based on the findings, some recommendations were made which include; that in-service training, seminars and workshops should be organized by government and relevant professional bodies like STAN to educate and sensitize the teachers on the need for AVM and on how to effectively use them for their lesson delivery.

Keywords: Audio-visual materials, Interest, Chemistry.

INTRODUCTION

In Nigeria and perhaps in other parts of the world, Chemistry is considered as a core science subject alongside physics and biology. It is a subject that permeates other areas of science such as engineering, geology, medical sciences and so on. Chemistry is the study of matter, its composition, properties and uses. It is one of the science subjects that can promote students intellectual development through critical thinking of things around them and its transformation. Within the context of science education, Chemistry has been identified as a very important school subject and its importance in scientific and technological development of any nation has been widely reported, especially, in Nigeria where the national income rest on petroleum and petrochemical industries (Adesoji and Olatunbosun, 2018). Chemistry has proven itself to be a very important subject in the secondary school science curriculum as its study is pivotal to further studies in other areas of science in the university.

Unfortunately, in the Nigerian educational system, Chemistry has acquired a negative connotation among senior secondary school students. The students perceive chemistry as abstract, difficult and uninteresting and hence tend to shy away from its study. This should not be, as consistent poor attitude

towards Chemistry by secondary school students could hinder the improvement of the country in science and technology, especially as the country's national income rests on petroleum and petrochemical products.

Chemistry has proven to be a difficult subject for many students (Johnstone and Otis, 2006), containing many abstract concepts which are central to further learning in both chemistry and other sciences (Taber, 2002 in Uzezi, Danjuma, Auwal, (2017)). These abstract concepts the authors noted are important because further chemistry/science concepts or theories cannot be easily understood if these underpinning concepts are not sufficiently grasped by the student. To make Chemistry less abstract to the students, the methods used in teaching it is of great importance.. Chemistry should be taught in such a way that enables the students visualize and have first-hand experience of the contents being taught. By this, the subject becomes real and interesting to the students.

Lack of interest has been noted as an important factor that has contributed to the students perceiving Chemistry as difficult. Interest is defined by Typhoon International Corp. (2004) as the "attention with a sense of concern; lively sympathy or curiosity; and the power to excite or hold such attention". Paul (2014) described interest as a psychological state of engagement, experienced in the moment, and also a predisposition to engage repeatedly in particular ideas, events, or objects over time. Interest promotes comprehension and memory for several reasons: interest increases attention to a text; interest makes people process a text more deeply; and interest promotes good meta-cognitive strategies (Silvia, 2006). Interest is very important if one must perform well in science. Many researchers have investigated on the effect of interest on academic performance. Kpolovie, Igho and Okoto (2014), unanimously agreed that improvement of students interest in learning and attitude to school could contribute in boosting their performance academically. Okenyi (2014) is of the view that most students lack interest in core science subjects and consequently decline from science oriented courses in the university.

There are many active learning strategies that can be used in the chemistry to arouse students interest in the science classroom. They include the use of instructional materials (in the form of computer based teaching, multi-media based learning, ICT integrated learning approach and audio visual materials), discussion, game playing, project demonstration, discovery, brainstorming, problem solving method and process based approach among others (Are and Are 2017). These methods develop in students critical thinking skills, creativity, open mindedness, intellectual honesty and so on.

Instructional materials can be divided into three broad groups; audio materials, visual materials and audio-visual materials (Bello and Umar 2016). Audio materials are materials that stimulate the sense of hearing such as radios, cassettes and so on. Visual materials are those materials that stimulate the sense of sight. These include; flashcards, posters, charts, textbooks, real objects, models, chalkboard and so on. Audio-visual materials are those materials that stimulate both the visual (sight) and auditory (hearing) senses. Examples are computers, videos, and televisions among others. (Arop, Umanah and Effiong 2015).

Audio visual materials, according to Webster's Encyclopedia Unabridged Dictionary of English (2012), are "training or educational materials directed at both the senses of hearing and the sense of sight, which may include but not limited to films,

recordings, photographs, among others used in classroom instructions, library collections or the likes". Vikko (2003) describes audio visual materials as the instructional system which uses the operations of the scientific and technological equipment combining both visual projections and sound productions to provide tangible experiences to learners. Some of such materials the author noted are computer assisted instructional materials, videotaped instructional materials and film shows/slides.

Several researches around the globe have investigated into the use of audio – visual materials in teaching and learning. For instance, Akinwole(2015) investigated into the effects of audio visual materials in the teaching and learning of speaking skills. Ashaver and Igyuve (2013) investigated the use of audio visual materials in the teaching and learning processes in colleges of education. The authors described audio-visual materials as materials with both audio and visual presentation to support teaching and learning particularly in improving comprehension and retention.

The importance of audio-visual materials in the teaching and learning of science is very profound, bringing many benefits to both the teacher and the students. Audio-visual materials makes it possible for the students to be familiar with the topic taught through the use of materials which the students can hear and see things for themselves (Akinwole, 2015). Audio-visual materials can play a major role in making learning permanent. Swank(2011) stressing the effectiveness of audio visual materials in learning estimates that about 40% of our concepts are based upon visual experience, 25% upon auditory, 17% on tactile, 15% upon miscellaneous organic sensation and 3% upon taste or smell. With the above assertions, it becomes clearer why audio-visual materials are important in the teaching and learning process. This is because it contributes to the clarity of information presented by allowing students visualize what is learned. The present research is aimed at establishing the extent to which audio-visual instructional materials improves interest in learning chemistry.

This study also determined the effect of audio-visual materials on male and female students' interest in chemistry. Gender disparity in science education has remained a matter of great concern to researchers. Nwagbo (2006) cited in Arop et al (2015) stated that apart from factors such as teaching method, and the teacher, gender is also implicated in students' achievement in science. Fatokun, Egya and Uzoechi (2016) noted that in many Nigerian schools, female students are presumed to evade the study of chemistry due to several factors like psychological, motivation and interest. The males appear to have a natural positive attitude to science subjects while girls show negative attitude. This negative attitude appears to be due to the acceptance of the myth that boys are better in science subjects than girls. This narrative has changed in recent years as there seems to be an influx of females in science and technical related disciplines. Aniodoh & Offor (2014) are of the opinion that if given the same opportunities, the females are high achievers as well as the male. The present study will determine the effect of audio visual materials on gender.

Purpose of the Study

The main purpose of this study was to determine the effect of audio visual-materials on Senior Secondary School Chemistry students' interest in chemistry in public schools in Agbani Education Zone of Enugu State.

Specifically, this study sought to determine the effect of audio-visual materials on:

1. students' interest in Electrolysis in Agbani Education Zone of Enugu state.
2. male and female students' interest in Electrolysis in Agbani Education Zone of Enugu state.

Research Questions

1. What are the mean interest scores of students taught Electrolysis using audio-visual materials with lecture and those taught Electrolysis using lecture method only?
2. To what extent do male and female students differ in their interest in Electrolysis when taught using audio-visual materials with lecture and those taught using the lecture method only?

Research Hypothesis

The following null hypothesis were tested at .05 level of significance

Ho1: There is no significant difference between the mean interest scores of SS2 students taught Electrolysis using audio-visual materials with lecture method and those taught Electrolysis with lecture method only.

Ho2: There is no significant interaction of gender and method on SS2 students mean interest scores in Electrolysis.

Methodology

The study employed a Quasi-Experimental study of the non-equivalent control group type. This study was conducted in public secondary schools in Agbani Education Zone, which is one of the six education zones in Enugu state.

The population for the study consists of all co-educational public senior secondary two (SS2) students in Enugu South Local Government area of Agbani Education Zone of Enugu State, 2019/2020 academic session which consists of seven coeducational schools. They were seven hundred and eighty nine (789) SS2 students in the seven (7) co-educational schools. (Source, Post Primary School Management Board, PPSMB, 2019/2020).

The sample for the study consists of a total of one hundred and forty eight (148) students in two (2) out of the seven (7) co-educational schools in Enugu South Local Government Area of Agbani Education Zone. Seventy-five (75) of the students were male while seventy three (73) of the students were female. The sampling technique used for this study is the purposive sampling technique. This was purposefully used to sample two (2) public co-educational secondary schools which had more than one intact SS2 classes. In each of the sampled schools, simple random sampling technique (balloting) was used to sample two intact SS2 classes. One of the intact classes was used as the experimental group, while the other intact class was used as the control group.

The experimental procedure involved developing the experimental packages, training the research assistants and administering the instrument. The experimental package used for this study is videos on electrolysis, lesson plan and note. Videos (viewed through a projector) were played at intervals during the lesson for the treatment groups while the control groups were taught without videos.

Data were collected with Chemistry Interest Scale (CIS) developed by the researcher which was used as pre-test and post-test. The instrument was structured in a four-point rating scale of Strongly Agree (SA). Agree (A), Disagree (D) and Strongly Disagree (SD). The reliability estimate for internal consistency was determined using the Cronbach Alpha and found to be .86

In order to analyze the data, mean and standard deviation were used to answer the

research questions while analysis of co-variance (ANCOVA) was used to test the research hypothesis at .05 level of significance and 1 degree of freedom. ANCOVA was used in order to correct the error of initial difference in the ability levels among the students in the intact classes.

Results

The results were presented in respect to the research questions and hypothesis that guided the study.

Research Question 1

What are the mean interest scores of students taught Electrolysis using audio-visual materials with and those taught Electrolysis using lecture method only?

Summary of result of data analysis is presented in table 1 below

Table 1: Mean interest scores and standard deviations of SS2 students taught Electrolysis using audio-visual materials with and those taught Electrolysis using lecture method only

Group	N	Pretest		Posttest		Gain Score
AVM (Experimental group)	75	Mean(x) 1.31	SD 1.02	Mean (x) 5.23	SD 0.36	3.92
Lecture method (Control group)	73	1.53	1.01	1.98	0.76	0.45

Table 1 shows that the Pre-test mean interest scores and standard deviations for students taught with AVM were 1.31 and 1.02 respectively, while 1.53 and 1.01 respectively were for students taught using lecture method. The Posttest mean interest scores and standard deviations were 5.23 and 0.36 for students in AVM group, while 1.96 and 0.76 for students in lecture method group respectively. Moreover, standard deviation value in the Posttest of the experimental group is far below compared with the control group. This indicates very little or no of existence of extreme scores which showed that the mean was more reliable and a true representation of the groups' ability. The students in the experimental group developed higher interest in chemistry than students in control group with gain score of 3.92 indicating that with AVM method is highly interesting than with only lecture method of instruction.

Research Question 2

To what extent do male and female students differ in their interest in Electrolysis when taught with audio-visual materials and lecture method?

Table 2: Mean scores of students on the effect of audiovisual materials on male and female students' interest in Electrolysis.

Gender	N	Pretest		Posttest		Gain Score
		Mean (x)	SD	Mean (x)	SD	
Male Students With AVM	40	2.77	0.81	3.61	0.69	0.02
Female Students AVM	35	2.99	0.73	3.01	0.75	0.84

Data in table 2 shows the effect of audio-visual materials on male and female students' interest in chemistry. The pretest mean interest scores and standard deviations were 2.77 and 0.81, while 2.99 and 0.73 were for male students respectively. The posttest mean interest scores and standard deviations of male were 3.61 and 0.69, while female students were 3.01 and 0.75 respectively. Hence, the posttest mean interest scores of both groups were moderate showing that the two groups gained moderate interest in chemistry. However, the female students gained more interest in chemistry with 0.84 gain score. In addition, the lower standard deviation of the female students showed that the mean was more reliable than the male students which are a true representation of the groups' ability.

Hypothesis One

There is no significant difference in the mean interest scores of SS2 students taught Electrolysis using audio-visual materials with lecture method and those taught Electrolysis with lecture method only.

Table 3: Analysis of covariance (ANCOVA) for students mean interest scores in Chemistry.

Source	Type 111 sum of squares	Df	Mean square	F	Sig	Decision
Corrected model	14118.91[a]	1	14118.91	16.83	.000	S
Intercept	954255.27	1	954255.27	1137.65	.000	S

Method	14118.91	1	14118.91	16.83	.000	S
Error	256669.64	146	838.79			
Total	1225175.00	148				
Corrected total	270788.55	147				

S _____ Significant. NS _____ Not Significant

(a) R squared = .052 (Adjusted R squared = .049)

From table 3, method gave an f value of 16.83 and this is significant at .000. Since .000 is less than 16.83. This means that at .05 level of significance, the f value of 16.83 is significant. Null hypothesis is therefore rejected as stated. This indicates that there is a significant difference in the mean interest scores of SS2 students taught using audio visual materials with lecture method and those taught without audio visual materials, with the experimental group gaining more interest than their counterparts in the control group.

Hypothesis Two

There is no significant interaction of gender and method on SS2 students mean interest scores in Electrolysis.

Table 4: Analysis of covariance (ANCOVA) for students mean interest scores of SS2 males and females students taught using AVM

Source	Type 111 sum of squares	Df	Mean square	F	Sig	Decision
Corrected model	14118.91[a]	1	14118.91	16.83	.00	S
Intercept	954255.27	1	954255.27	1137.66	.00	S
Gender	14118.91	1	14118.91	16.83	.00	S
Error	256669.65	73	838.79			
Total	1225175.00	75				
Corrected total	270788.56	74				

S _____ Significant. NS _____ Not Significant

(b) R squared = .05 (Adjusted R squared = .05)

From table 4, method gave an f value of 16.83 and this is significant at .00. Since .00 is less than 16.83 this means that at .05 level of significance, the f value of 16.83 is significant. Null hypothesis is therefore rejected as stated. This indicates that there is

a significant difference in the mean interest scores of males and female SS2 students taught using AVM and lecture method with the females gaining more interest than their female counterparts.

Summary of Findings

1. Students taught with AVM developed higher interest in Chemistry than students taught with lecture method. The result of the hypothesis also revealed that the mean interest scores of male and female students taught using audio visual materials and those taught without audio visual materials differed significantly
2. The mean interest scores of both male and female students were moderate showing that the two groups gained moderate interest in chemistry. Though, the female students gained more interest in chemistry. Equally, the hypothesis test indicated a significant difference in the mean interest scores of males and females taught using audio visual materials.

Discussion of the Findings

The major findings of this study were presented based on the major variables investigated in the work.

Audio Visual Material and Students' Interest in Electrolysis

From research question one and hypothesis one, the difference between the mean interest scores of the groups was significantly on the side of the experimental. Students who were taught chemistry with AVM developed higher interest than their counterparts who were taught the same topic without AVM. Furthermore, the standard deviations for AVM group was very low when compared with the group taught without AVM. This implies very little or no extreme scores in the AVM group. The mean reliability showed a true representation of the AVM group's ability. Hypothesis question two, presented in table eight showed that there was statistically significant difference existing among the interests of the two groups (WAVM and AVM i.e. pretest and posttest scores).

From the above result, there was no enough evidence for accepting the null hypothesis one which states that "There is no significant difference in the mean interest scores of students taught using audio visual materials and those taught without audio visual materials". The hypothesis is therefore rejected. The finding agrees with the finding of Tang and Intai (2017) who investigated the effectiveness of audio visual materials in teaching the topic reproduction, a lower secondary science topic in a rural secondary school in Miri, Sarawak. The result of the study showed that students were more attentive when audio visual materials were played. Also, majority of the students in the experimental group agreed that the audio-visual materials increased their interest and ability to remember the contents.

Effect of audio-visual materials on male and female students' interest in chemistry

Table 2 and 4 revealed that there was a significant difference in the mean interest scores of males and females taught using audio-visual materials.This outcome agrees with the findings of Ode (2014) who carried out a study on the impact of audio-visual resources on teaching and learning in private secondary schools in Makurdi metropolis. The findings from the study suggested that the use of audio-visual resources significantly affected teaching and learning as they promoted better understanding and expanded students' learning experience. This existed this way because students' interest could be aroused and retained through the use of multimedia instructional approach. Interest is an important factor in learning because when one becomes interested in any activities one

is likely to be more deeply involved in that activity. It is a subjective feeling of concentration or curiosity over something. It is the preference for particular types of activities. Interest plays a vital role in learning and teaching process. At the classroom level and beyond, learning can be meaningfully achieved within the content of optimal disposition of the learner of the tasks in question closely related to interest is achievement.

From the study, one can deduce that students' interest can be aroused and sustained when AVM is used in teaching of chemistry.

Conclusion

Based on the findings of the study, the following conclusions were made

1. Incorporating audio-visual materials in chemistry lesson delivery arouses higher interest than using only lecture method of instruction.
2. It is affirmed that there was significant difference in the mean interest scores of males and females taught using audio visual materials. Male students gained more interest than their female counterparts taught chemistry using AVM.

Recommendations

Based on the results obtained and discussed in this study, the following recommendations are hereby made:

1. AVM (such as videos) should be integrated into regular science classroom instruction by chemistry teachers along side teaching methods such as the lecture method, for the teaching of Chemistry in Senior Secondary Schools in order to arouse and sustain students interest in Chemistry.
2. There is need for curriculum planners to include AVM as important teaching materials in the curriculum and enforce its use in secondary schools.
3. Government should ensure adequate provision of AVMs and associated gadgets in secondary schools, ensure effective implementation and use of these materials through regular visits to secondary schools by educational monitoring team.
4. Government and relevant professional bodies such as STAN should regularly organize in-service training programs for teachers' professional development on the effective integration and use of audio-visual integrated strategies in regular classroom lessons through seminars, workshops and conferences.

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