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Effects of animated-media instructional strategy on students' interest in chemistry when compared to those taught using conventional method using their pretest and posttest mean scores.

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ABSTRACT
Interest is a motivational variable which describes the psychological state of engaging or the predisposition to re-engage with a particular class of object, events, or ideas over time. The aim of this research was to determine the effects of animated-media instructional strategy on students' interest in chemistry when compared to those taught using conventional method using their pretest and post test mean scores. The design of the study was quasi-experimental, specifically the pretest-post test non-equivalent control group design. The result shows that the animated-media group had higher gain mean interest score (18.86) than those in the group taught using conventional method which had gain mean score of 5.93. Also the effect of animated-media instructional strategy on students' interest in chemistry is significant when compared to those taught using conventional method using their pretest and post test mean scores. The findings of this study revealed that animated-media instructional strategy positively affected students' interest in chemistry. The conclusion is that students' passiveness during learning facilitates forgetfulness but the use of animated-media instruction significantly enhances interest in chemistry.
Keywords: animated-media, strategy, students, chemistry

INTRODUCTION

Chemistry is a science, which means its procedures are systematic and its hypotheses are tested using the scientific method [1,2,3]. The objectives of teaching chemistry at senior secondary schools level were spelt out by Federal Republic of Nigeria (FRN) in the National Policy on Education and reinforced by examination bodies namely, the West African Examination Council (WAEC) and National Examination Council (NECO) and curriculum development body such as Nigerian Educational Research and Development Council [4,5,6,7,8,9,10]. These objectives have been thought of in terms of what chemistry can contribute to the realization of the aims of secondary education in Nigeria. The objectives include giving students a sound knowledge of their immediate environment; inculcate in students' useful skills and outlooks that will enable them to make auseful contribution to their community and nation at large; to develop in students the critical thinking ability, accuracy and objectivity for proper and logical investigation; among others [11,12,13]. To achieve these objectives, foundational concepts in chemistry must be mastered by the students. The foundational concepts which include among others, the concepts ofelement, compound and mixtures; electronic configuration; periodic table and elements as well as physical and chemical combination lays the

foundation for the understanding of how chemicals react. Apart from obsoletes' and inadequacy of equipment and laboratories for teaching chemistry, some teachers lacked in-depth knowledge of the subject matter and also applicationto inappropriate teaching methods, [14,15,16,17]. Atadoga and Onaolapo (2008) reported that the kind of instructional strategies to be adopted by teachers for meaningful learning is dependent on teachers' competency, concept to be taught, learners' age and available resources and space. Researchers [18,19,20] found that the persistent low academic achievement in science education including chemistry could be attributed to teacher instructional strategies among others. Thus, instructional strategies used by teachers in teaching-learning process have asignificanteffect on not only the learners' academic achievement but also on their interest. Interest is a motivational variable which describes the psychological state of engaging or the predisposition to re-engage with aparticular class of object, events, or ideas over time [21,22,23,24]. Interest may be seen as the outcome of an interaction between a person and a particular content. Interest according to [25,26,27,28] refers to the emotionally oriented behavioural trait which determines a student's vim and vigour in tackling educational programmes or other activities. It is the view of [29,30,31,32] that the content of learning and the experience provided during instruction is a critical factor that drives not only interest and its developmentbut also the retention of learning. Animated-media instructional strategy involves the use of two or more different types of animated instructional media in thepresentation oflesson. Supporting this view, [33,34,35,36] noted that animated teaching involves the use of Video Compact Disc (VCD), Digital Video Disc (DVD), powerpoint, or 16mm film. Animation teaching could be in form of lesson presentation, through the use of still pictures; texts, graphics, motion pictures, background sounds, accompanied by some narrations in order to enhance students understanding of concepts. It also includes the use of interactive elements such as graphics, text, video, sound, and cartoon teaching [37,38,39,40].

Purpose of the Study

The purpose of the study was to investigate the effect of animated-media instructional strategy on students' interest in chemistry when compared to those taught using conventional method using their pretest and post test mean scores in Awka Education Zone.

Significance of the Study

The result of this study will be of great benefit to principals, chemistry teachers, students, textbook publishers, writers and researchers.

Research Question

The following research question guided the study: What is the effect of animated-media instructional strategy on students' interest in chemistry when compared to those taught using conventional method using their pretest and posttest mean scores?

Hypothesis

The following null hypothesis was tested at 0.05 level of significance: effect of animated-media instructional strategy on students' interest in chemistry when is not significant compared to those taught using conventional method using their pretest and posttest mean scores.

Review of Related Literature

Conceptual Framework

Animation-media Instruction Strategy

Educational animated-media according to [41,42] are animations produced for the specific purpose of fostering learning. The popularity of using

animated-media to help students understand and remember information has greatly increased since the advent of great graphics-oriented computers. This technology allows animated-media to be produced much more easily and cheaply than in former years. Previously, traditional animated-media required specialized labour-intensive techniques that were both time-consuming and expensive. In contrast, software is now obtainable that makes it possible for individual educators to author their own animations without the need for specialist expertise. Teachers are no longer limited to relying on static graphics but can readily convert them into educational animated-media that can be used for instruction. Animated-media instructional strategy is an animation-oriented instruction where the teacher employs the use of animated texts, graphics, cartoons and others in the instructional process. The use of animated-media instruction can be accomplished through the use of animated-media teaching aids. According to [43], animated-media teaching aids aredevices that have the facial appearance of both audio and visual representations that are used in the teaching/learning process for effective dissemination of knowledge. According to [44], animated-media has three characteristics namely: the simulation; display of movements and picture. Animated-media instruction mustcorrespond to the context of the topics, otherwise, it becomes distracting, and the objective intended in using it is defeated. The study,therefore, centres on animations as the rapid display of asequence of pictures on acomputer screen that has the potential to provide feedbacks in student's achievement, interest and retention in learning.

Interest

Interest refers to a critical cognitive and affective motivational variable that guides attention, facilitates learning in different content areas, for all students of all ages, and develops through experience. [45] held that the aim of teaching is to secure students'attention through arousing and maintaining interest in lessons of multidimensional instructions. [46] reported that idle learning environment and methods, functional teaching material and a motivating teacher have apositive effect on students' interest in learning. [47] indicated that students exhibit a high level of interest in solving statistic concepts through animations and have posited the use of animated-media technology as a gateway to students' inquiry-based scientific investigations. Interest can be the cause of activity and the result of participation in theactivity. Interest, therefore, is the psychological state of whereby students' pay attention to an action. Interest in this study is a feeling of curiosity or concern about thesubject topic (in this case, chemical combination concept) that create attention towards it [48].

Studies of animated-media instruction strategy on students' interest

[49] examined the effect of animation instructional strategy on students' achievement, interest and retention in chemical bonding. The purpose of the study was to investigate the effect of animation instructional strategy on students' achievement, interest and retention in chemical bonding. Six questions guided the study and six hypotheses were tested. The design of the study was quasi-experimental. The study was carried out in Enugu Education Zone of Enugu State. The population for the study consisted of all the 3221 senior secondary one (SS1) chemistry students in the fifty-four (54) schools in Enugu Education Zone of Enugu State. The sample size of five hundred and fifty-four (540) SS1 chemistry students.

METHODS

Research Design

The design of the study is quasi-experimental, specifically the pretest-posttestnon-equivalent control group design. Quasi-experimental design is one that seeks to establish the cause and effect relationship between the variables of interest in the study but where therandom assignment of subjects to experimental and control groups is not possible [40]. According to [41], in such research, intact or pre-existing groups are used. The study used two group; experimental and control. The design was adopted for this study because the administrative set-up in the secondary school system would not allow for randomization of students into experimental and control groups, thus, intact classes were used. The design of the study is shown in figure 1.

Group	Pretest	Treatment	Posttest	Post-Posttest (Retention)
E	O_1	X	O_2	O_3
C	O_1	~X	O_2	O_3

Figure 1:Design of the experiment

Where

E = Experimental group

C =Control group

O_1 = Pre-test administration

X_1= Experimental Treatment (teaching using animated-media instructional strategy)

X_0= Control Treatment (teaching using conventional method)

O_2= Post-test administration

0_3= Post-posttest administration (Retention)

Area of the Study

The area of the study was Awka Education Zone in Anambra State. Anambra State is located in the old Eastern Region of Nigeria. The geographical location of the boundaries are as follows; in the North is Kogi State, in the South is Imo State and River state, in the East, is Enugu State and the in the West is Delta State. Anambra State comprised the six Education Zones namely; Aguata, Awka, Onitsha, Nnewi, Ogidi and Otuocha Education zones. The State Education Commission centrally controls these Zones. The curriculum, textbooks, school year, examination trends and instructional practices are the same for these zones making it possible that what happens in each of these Zones can be generalized to other Zones in the state. There are 59 secondary schools in Awka Education Zone out of which 24 are aco-educational secondary school for the 2015/2016 academic session (Source: Zonal Education Office Amawbia 2015/2016 Statistical returns). Most people living in Awka are civil servants, lecturers, teachers, students and traders.

Population of the Study

The population of this study is 1250 SS2 chemistry students from the 24 co-educational public secondary schools in Awka Education Zone. This constituted 500 males and 750 females (Source: Planning, Research and Statistics Department, Post Primary School Service Commission, 2017). The SS2 class was chosen for the study because at this stage, students can comprehend and understand chemical concepts; organize themselves independently as may be required during research studies. Also in SS2 class, students are likely to show more interest in chemistry since they are approaching their final examination in chemistry at

the West African Secondary School Certificate level.

Sample and Sampling Technique

The sample for the study was 122 SS2 chemistry students. First, simple random sampling (balloting with replacement) was used to select two schools from the co-educational schools. The two schools were categorized into experimental and control groups. In both schools, since the chemistry students are only in two arms, both arms were used. Thus, two intact classes (one from experimental group and one from control group) wereused for the study.The experimental group consisted 27 males and 50 females and the control group had 20 males and 25 females.

Instruments for Data Collection

The instruments for the study were Chemical Combination Achievement Test (CCAT) and Chemistry Interest Scale (CIS).

Chemical Combination Achievement Test (CCAT)

CCAT contained 40 questions developed by the researcher to determine the level of achievement and retention of students in chemical combination concept. The instrument was developed from the chemical combination concepts of senior secondary school chemistry curriculum. The CCAT itemsconsist of 40 objectives (multiple choice type) test questions each with four alternatives (A-D) answer options. The item took into consideration all the six Bloom`s taxonomy of educational objectivesthrough the use of a table of specification to ensure equal distribution of the items over the units. CCAT was also designed to generate information on the demographic data of the students.

Chemistry Interest Scale (CIS)

The Chemistry Interest Scale (CIS) is a 20 items interest scaledeveloped by the researcher to determine the interest of students before and after treatment on the concept of chemical combination in chemistry. The items were developed using afour-point scale of very much like VML, Like- L, Dislike D, very much dislike VMD. The instrument was also designed to generate demographic information on the students. Also, lesson plans were developed for the experimental group.

Validation of the Instruments

The purpose of the study, the research questions and hypotheses and the initial drafts of the CCAT, CIS and the lesson plans were given to two lecturers and one experienced secondary school teacher for validation. The lecturers were from the Departments of Educational Foundation (Measurement and Evaluation) and Science Education. The validators were requested to vet the achievement tests in terms of suitability of the items in the CCAT, suitability of the language, relevance of each item, content coverage and any other consideration outside the ones indicated. They were requested to write M (modify), D (delete), R (retain) against items they wish the researcher to modify, delete or retain. Their corrections and suggestions were effected in the final draft of the instrument.

Reliability of the Instruments

Reliability test for the data collection instruments was carried out to determine the internal consistency of the instrument. The reliability of the CCAT was established using the Kuder-Richardson 20 (KR20) and that of CIS using Cronbach Alpha. [42] posited that Kuder Richardson 20 and Cronbach Alpha methods involved single administration of the instrument and that they could be used to establish the internal consistency of instruments. The Kuder Richardson 20 is good for dichotomously scored data while the Cronbach Alpha technique is excellent for the polytomous data. Copies of CCAT and CIS were administered to 20 respondents drawn from Onitsha high

School, Onitsha. The scores obtained were subjected to KR20which yielded coefficient of internal consistency of 0.85. The reliability of Chemistry Interest Questions (CIS) was established with Cronbach Alpha method and the coefficient of internal consistency was 0.87. The reliabilities were adjudged to be very high for use in the study. This is in line with the assertion of [43] that if the reliability coefficient yields 0.60 and above, it is high enough for use in educational research purpose.The details of computations are attached as.

Animated-Media Package

Animated-media Package is a package adapted from lectures on chemical combination by [44] and used as an instructional strategy for the experimental group. The animations were developed with the aid of the Microsoft office powerpoint, Adobe flash files (soft files), GIF animated images, Internet downloaded chemical combination instruments. These components embedded into the Microsoft document to form a single animation package. Adobe flash files (soft files) were imported into the power point using computer software named adobe acrobat. GIF animated images were adapted and modified using computer software called graphic image processing software (GIMP) to suit this work. The modification consisted in removing the unwanted animations or other emphasizes by editing the file and removing unwanted files. Images used in the package were downloaded from www.flicker.com;www.tumblir.com;and; Google images. Adobe Flashsoftware was used to independently play all soft files. The animated images downloaded from an internet source and included animated ionic bonding versus covalent bonding instrument, covalent bonding, how atoms bonds. These images were in form of JPEG, PNG, GIF, BMP. In all the above image forms, only GIF format supports animation. However, computer software called GIMP converted all the images to animated package that can be projected and displayed as motion images. The animation was downloaded and modified to suit this work.The animation was based on the following content of chemistry: atomic structure; principles of filling in shells, binding forces and chemical combination.

Experimental Procedure

The researcher with the aid of two research assistants who were the chemistry teachers in the sampled schools carried out the research. The researcher had meetings with the research assistants in which the objectives of the study were explained to them. The researcher trained the two research assistant for one week in three contacts for 2 hours per contact.

Teaching of experimental and control groups

Teaching of the experimental group was conducted by trained research assistants. However, prior to the administration of treatment, pretest was administered to the group to determine their prior knowledge related to chemical combination concepts. Experimental group in this study are groups of students exposed to experimental treatment (teaching using Animated-Media instructional Strategy). The treatment has six distinct stages collapsed into three major stages namely, pre-animated-media; content delivery and post-animated media. Pre-animated-media stage dealt with the provision of an enabling environment for the conduct of animated-mediainstruction. Here, provision was made for the computer, projector, animated chemical combination software, animated flashcards and the supply of power without interruption throughout the lesson. Sitting arrangement was that there is enough space for projection so that it will not affect the appearance of the image on the screen. As part of pre-animated media state, the teacher ensured that students observed the preparation before the presentation. In addition, objectives of the lesson were clearly stated and explained to the students.The next stage is content

delivery or animation stage, where the teacher begins with brief introduction of the lesson to the students. That is, the teacher asked students to narrate their experience on chemistry, what combination, chemical, atom is all about. This is then followed by power point projection of the developed animated package in the class based on the topic of discussion. Each episode is projected on the screen and students were actively participating in observing, recording, and discussing the presentation. The role of teacher is facilitating and clarification of points unclear to students. Flashcards based on chemical combination concepts projected were also distributed to students as part of the package to enable them interacts with the media and perform activities of animations during the lesson. It should be noted that after each episode, students performed activities based on it and the teacher interacted with students in answering questions and observations raised during projection and activities. The last stage of the lessonwas evaluation stage which is a stage of determining whether the stated objectives have been achieved or otherwise. At this stage, the teacher asked students some questions based on the lesson treated with a view to remedying some areas of difficulties observed during the lesson. At the end of each lesson, students had some take home exercise on chemical combination concepts. This exercise lasted for a period of six weeks with two hours fifteen minutes (45 minutes per period) interaction per week. Immediately after the treatment, the test instruments were re-administered on students as a posttest to determine the achievement and interest of students in chemical combination concept. After 4 weeks of posttest, the same CCAT was re-administered as postpost test to determine students 'retention ability. The treatment administration can be summarized as follows: Step 1:Pre-animation stage (ensure that all relevant materials for animation are adequate and ready to be used). Step II: Introduction (link students' previous knowledge with the lesson to be treated through questioning and activities). Step III: Content Delivery (power point presentation of animated chemical combination concepts). Step IV: Teacher-students' interaction to clarify points. Step V: Activity stage (integrating teaching with various students' activities using other graphic animated-media package). Step VI: Evaluation (this involved application of questioning techniques to determine the attainment of the objectives of the lesson or otherwise). Step VII: Review/Conclusion (highlight and clarify point and areas of difficulties observed during the lesson; allow students to produce their own note through observation during presentation and; ask them to perform some take-home assignments based on the lesson treated). During the experiment, two different treatment patterns were applied by the research assistants (teaching using Animated-Media Strategy and conventional method). Lesson plans for both groups addressed the same instructional objectives based on the same content of chemical combination. However, the experimental plans provided opportunities for small group interaction, activities, and sharing of media resources among the members. Conversely, students in the control group received lectures in the class only. The control group was provided with theconventional routine situation in the classroom while the experimental group was provided with Animated-Media Instructional Strategy as treatment.

Teaching the Control Group

The teaching of the control group was also conducted by another research assistant using conventional method. Prior to the actual teaching, pretest was administered tthe group to determine their prior knowledge related to chemical combination concepts. In each lesson, objectives were clearly stated to

the students and questions were asked in the introductory part to enable students to link their previous knowledge with the lesson to be treated. In the content delivery, the presentation involved verbal communication of chemical combination concepts between the research assistant and the students without integrating any media as in the case of the experimental group. The same content was delivered to the two groups for a period of four weeks after which posttest was administered to determine students` achievement and interest in chemical combination concepts. After a period of four weeks, another test called post posttest was administered to the same group to determine their retention abilities.

Method of Data Collection

In order to generate achievement, retention and interest scores using the CCAT and CIS research instrument, the researcher adopted the pre-test, post-test and post-posttest technique. In the pre-test, the instrument was administered on the participants in their various schools; a conference marking of the scripts was carried out. Each script was vetted and totalled section by section by the researcher. Each participant's score in a section of the instrument was entered against his or her serial number. This exercise was repeated after the post-test, post-posttest and the final result sheets completed. Copies of these sheets titled raw scores ofstudent groups (according to school and treatment types) were then handed over to computer analysts for data analyses.

Method of Data Analysis

The responses of the subjects to CCAT were scored using the marking scheme. Each correct response attracted 2.5 point with maximum score of 100 marks. The Chemistry Interest Questionnaire has 20 items to measure the interest of students on Chemical combination concept of chemistry. The item scales were scored thus: Very much liked VML has 4 points, Liked – L has 3 points, Dislike D has 2 marks, Very much dislike VMD has 1 mark. For students who scored 50 and above in the posttest, retention and post-interest test, the treatment was said to be effective. For students with the highest gained mean, the treatment is said to be more effective. The research questions were analyzed using mean, while the hypotheses were tested using Analysis of Covariance (ANCOVA). The use of ANCOVA was to control the initial group difference. The decision rule was that the null hypothesis be rejected when p-value is less than 0.05 and not to reject the null hypothesis when p-value is greater than 0.05.

PRESENTATION AND ANALYSIS OF DATA

Research question 1: What is the effect of animated-media instructional strategy on students' interest in chemistry when compared to those taught using conventional method using their pretest and posttest mean scores?

Table 1: Mean Pre-Test and Posttest Interest Scores of Students taught Chemistry using Animated-media strategy and Conventional method

Groups	N	Pretest Mean	Posttest Mean	Gained Mean	Decision
Animated-media	77	33.95	52.81	18.86	Effective
Conventional method	45	30.00	35.93	5.93	

Table 1 shows that the animated-media group had higher gain mean interest score (18.86) than those in the group taught using conventional method which had gain mean score of 5.93.

Hypothesis 1: Effect of animated-media instructional strategy on students' interest in chemistry when is not significant compared to those taught using conventional method using their pretest and posttest mean scores.

Table 2: ANCOVA on Effect of Animated-Media Strategy onRetention of Students taught chemistryand those taught usingConventional method

Source	SS	df	Mean Square	F	Sig.
Corrected Model	8312.858[a]	2	4156.429	23.924	.000
Intercept	7277.287	1	7277.287	41.887	.000
Pretest	228.056	1	228.056	1.313	.254
Method	6777.728	1	6777.728	39.011	.000
Error	20674.822	119	173.738		
Total	293713.000	122			
Corrected Total	28987.680	121			

Effect of animated-media instructional strategy on students' interest in chemistry is significant compared to those taught using conventional method using their pretest and post test mean scores.

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

Effect of Animated-Media Instruction Strategy on the Interest of Students

The findings of this study revealed that the use of animated-media strategy significantly enhanced the interest of students in chemistry. This improvement in the interest of the students can be attributed to the interaction and motivation which arose from the use of animated-media strategy. As observed by [50] that interest is one of the key factors and driving force that help students in paying attention as well as remaining engaged in school activities. [51,52] further noted that interest in learning can be affected by environmental factors and that interest is a critical cognitive and affective motivational variable that guides attention, facilitates learning in different content areas and for students of all ages, and develops through learning experience. The use of animated-media strategy may have enhanced the learning experience and enriched the learning environment. The use of animated-media can be said to have facilitated greater interaction between students and learning materials. This interaction may have aroused and sustained the students' interest in the subject matter. The findings of this study supports the findings of [53] that animated media instructions positively affects students' interest. The findings of the study also lend credence to the findings of [54] who reported that the use of technology such as animated instructional strategy increased students' interest and attention towards the concepts taught.

CONCLUSION

The findings of this study revealed that animated-media instructional strategy positively affected students' interest in chemistry. The conclusion is that students' passiveness during learning facilitates forgetfulness but the use of animated-media instruction significantly enhances interest in chemistry.

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