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

Pius Promise Obinna, Abumchukwu Angela Adanna and George Patience Chinaza
Department of Science Education Nnamdi Azikiwe University Awka
Email:promisepius850@gmail.com; aa.abumchukwu@unizik.edu.ng

ABSTRACT

Retention is the ability to retain and recall information or knowledge gained after learning. The aim of this research was to determine the effects of animated-media instructional strategy on students' retention in chemistry when compared to those taught using conventional method using their pretest and posttest mean scores. The design of the study was quasi-experimental, specifically the pretest-posttest non-equivalent control group design. The result shows that the animated-media group had loss in mean score of 18.75 while the conventional group had loss in mean score in retention of 40.95. With less loss in mean score, animated-media was effective for enhancing students' retention. In conclusion the findings of this research revealed that animated-media strategy positively enhanced students' retention and interest in chemistry. This implied that the animated-media strategy is effective for teaching chemistry concepts. Chemistry teachers should make recourse with animated-media software and develop animated media models to be used in the process of instructional delivery.

Keywords:animated-media, strategy, students, retention and chemistry

INTRODUCTION

Strategies for teaching chemistry outlined by scholars range from the use of laboratory activities, lecture, discovery, inquiry, demonstration, problem-solving, process approach, deductive and inductive, simulation, animation methods among others [1,2,3,4]. In addition, theefficacy of the strategies and their effects on student`s academic achievements were also outlined. [5,6] revealed the inquiry and demonstration methods were among the most effective strategies of teaching because students' cognitive achievement, interest, and retention of chemical combination of chemistry are attained and facilitated faster than in the other methods. [7] posited that discovery method enhances theacademic achievement of students. [8] reinforced this idea through the outdoor laboratory activities for junior secondary Basic Science, while [9] recommended the use of media technology because it holds promises of boosting academic achievement beneficially. Retention is the ability to retain and recall information or knowledge gained after learning [9]. Other researchers such as [10,11] defined several variables that affect retention. These include; the content or tasks to be performed, learners past experiences, the interval between lesson and evaluation and instructional strategies employed. [12] however, noted that the critical factor influencing retention of students is the level of learning experience provided in the lesson. It is their view that when the learning process engages more senses, rich learning environment and experience is created. To engage the students meaningfully in the learning process, the teacher must have to adopt innovative teaching methods such as

animated-media instruction strategy. This is why scholarly research advocated the use of multimedia such as animated-media in teaching and learning of science subjects like chemistry [13,14,15,16]. Multimedia teaching (MM) embraces the use of animation and cartoon style for its effective delivery. The multimedia approach can be used in teaching subjects like Chemistry, Biology, Physics, and Mathematics among others. Thus, this study used animated-media instructional strategy (computer, graphic, text, and sound) in teaching chemical combination concept. Animated-media instructional strategy is a form of animation instructional method that implies the use of computer animation in classroom instruction. [17] defined Animation as a way of making an instructional movie by using a series of drawings, computer graphics, or photographs of objects that are slightly different from one another and that when viewed quickly one after another create the appearance of movement. Literally, animation is moving something that cannot move by itself. It is the technique of photographing successive drawings or positions of puppets or models to create an illusion of movement when the film is shown as a sequence [18]. The scholars further refer to animation as a simulated motion picture depicting movement of drawn (or simulated) objects or as an image in motion. In educational terms, animations can be viewed as a technique of visualization. According to [19], educational animations are animations produced for the specific purpose of fostering learning. The popularity of using animations to arouse interest and to help students understand and remember information has greatly increased since the advent of powerful graphics-oriented computers. The use of technology allows animations to be produced much more easily and cheaply than in former years. Previously, traditional animation required specialized labour-intensive techniques that were both time-consuming and expensive. In contrast, software is now available 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 animations [20]. Animated-media instructional strategy involves the use of two or more different types of animated instructional media in thepresentation oflesson. Supporting this view, [21] 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 [22]. The flexibility of learning through animation allows a wider range of stimuli thus increases the students' engagement in learning. Studies by [23] revealed that students who learn from animation have greater self-esteem and motivation in ICT classes. The researcher added that animated pictures are used to support 3-D images in different displays, convey procedural knowledge, demonstrate the dynamics, and allow explorations through manipulations. The present study used animated-media instructional strategy involving computer projection to see if it could improve students' achievement, interest and retention of learning.

Purpose of the Study

The purpose of the study was to investigate the effect of animated-media instructional strategy on students' retention in chemistry when compared to those taught using conventional method using their pretest and posttest 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. Principals of schools might find the outcome of this study very useful since it will create for them an awareness of the need for using animated-media instructional strategy in teaching chemistry.

Research Question

The following research question guided the study:What is the effect of animated-media instructional strategy on students' retention 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' retention in chemistry is not significant when compared to those taught using conventional method using their pretest and posttest mean scores.

Review of Related Literature

Animation-media Instruction Strategy

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 [24], 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 [25], 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. [26] reiterated that animated-media as a means of facilitating teaching and learning processes in the schools, is not just a means of transforming knowledge, but more importantly, it can be an extension of both the teacher and the chalkboard.AnimatedmediaInstructional strategy is,therefore, the use of motion text, pictures or graphics, cartoons and model mimics as an instructional aid in the teaching and learning process.

Retention

Retention is defined as the ability of one to keep in mind what one has learned. It takes place when learning is coded into memory. Thus, appropriate coding of incoming learning or incoming information provides the index that may be consulted so that retention takes place without elaborate searchabilityand consequently making it difficult to remember the information [27]. [28] identified four methods of measuring retention. These are recall or reproduction; relearning or saving method (this involve calculating the number of trials taken to learn materials in the beginning and note down the savings of trials relearning it after some lapse of time); recognition; and reconstruction. A good memory and retention lead to meaningful learning leading to the production of series of changes within the entire cognitive structure, modifying existing concepts, and forming new linkages between concepts. According to [29], permanent and meaningful learning is the target of the educational endeavour. Understanding and retention are the products of meaningful learning when teaching is effective and meaningful to

the students. Several factors effect retention. For example, [30] stated that anything that aid learning should improve retention while things that lead to confusion, or interference among learning materials decrease the speed and efficiency of learning and accelerates forgetting. Interference may exist in several forms such as retroactive inhibition, or emotional inhibition. Retroactive inhibition occurs when things are learned in such a way that the result of that learning usually occurs after a passage time. In the intervening period, many other things are learned. This interpolated learning interferes with the memory of the original equipment and the interference is known as retroactive inhibition [31]. Retention, therefore, is the ability of students to remember material learned (chemical combination concept) after a given period.

Theoretical Framework

Theoretical Studies

Retention in chemistry and other Science Subjects

The history of students' low achievement in science subjects on a prominent scale is not new in Nigeria.According to [32], what is new is that this trend has continued unabated, and seems to loom longer since Nigeria's political independence. Chemistry as one of the science subjects is not left out. Infact, the trend of low achievement in chemistry and sciences, in general, has persisted for the past three decades. [33] reported that less than 20% of candidates who entered for WAEC 'O' level in chemistry obtain up to credit pass. Furthermore, [34] also explained that there is a persistent declining trend in students'achievement in science subjects at thesecondary school level. In terms of students' achievement, [35] stated that interest and retention are correlates of achievement. [36] placed interest after intelligence as factors that effect students' achievement, retention and also asserted that interest is determinants of success. Low achievement in science is attributed to lack of interest and retention in science subjects [37]. Teachers should,therefore, stimulate and sustain their students' interest through the use of varieties of teaching techniques. This would go a long way in promoting students interest in the sciences which would, in turn, stimulate high academic achievement in the area. Efforts at improving interest in science have also attracted the interest of researchers [38]. Although speculations point to the inability of science instructors to utilize electronic and other technological media as a major cause of poor interest and retention in science, enough research evidence has not been provided. As a result, the extent to which animated-media strategy could affect achievement, retention and interest and facilitate instruction in science to the benefits students need to be investigated. Hence, this study explored the extent to which animated-media strategy can enhance achievement, retention and interest in chemistry.

Factors Related to Achievement, Retention and Interest in Chemistry

Achievement, retention and interest in chemistry have been the major objects of research over the years. Achievement, according to [39] is partly a yardstick for measuring the extent of understanding of the nature of science. [40] defined interest as an internal state that effects the individual's personal actions. From the above definition, interest in chemistry refers to individual reactions, feelings and impressions about chemistry and chemistry related tasks or situations. [41] referred retention as the ability to retain and later recall information or knowledge gained after learning. Several researchers have worked on factors that effect achievement in chemistry. [42] observed that chemistry teaching in Nigeria schools has been predominantly lecture or expository in approach. [43] also attributed the apparently

consistent poor results in chemistry to the poor approach to chemistry instruction. Although it is widely acknowledged that there is no one best approach or method of teaching since research findings had revealed that some of these teaching methods interact in a well-defined manner with some personal attributes of learners to produce a more effective teaching and learning. Science has to do with the organization of knowledge which will contribute significantly to a better appreciation of natural phenomena. As such, science learning,therefore, requires the development of rational, critically thought out processes in the students to enable them toexplore, invent, discover and develop some of the tools of inquiry appropriate to the field of study [44]. [45] established a positive relationship between achievement, retention and interest in chemistry. Nzewi observed that students who claimed that chemistry was their favourite subject performed better than those whom it was not their favourite. Nzewi attributed poor achievement in chemistry to deficiency of qualified chemistry teachers. Stressing on science teachers' competence, Aremu and [46] noted that science graduates with no professional training are quickly drafted into the classroom to teach science in the hope that scientific literacy and ultimately scientific culture would have been achieved. [47] observed that in general, such teachers do not understand the nature of science and the appropriate ways to teach the basic concepts of science so as to inculcate science culture and a proper appreciation of science in students.

Empirical Studies

Effects of animated-media instructional strategy on students' retention

[48] examined the impact of animated-media strategy on achievement, retention and interest among secondary school geography students in weather concepts; Katsina state, Nigeria. The purpose of the study was to investigate the impact of animated-media strategy on achievement, retention and interest among secondary school geography students in weather concepts; Katsina state, Nigeria. The study was guided by four research questions and tested four null hypotheses. The study was quasi-experimental with pretest, posttest, post-posttest design. The population of the study was 699 SS2 students of Kurfi Education Zone of Katsina state. The sample for the study was 116 students randomly selected. Weather Concepts Achievements Test (WCAT) and Weather Concepts Interest Questionnaire were developed by the researcher and validated by experts. The reliability coefficients of WCAT and WCIS were established at 0.89 and 0.9 respectively. The experimental group was taught using Animated-media strategy while the control group was taught using conventional method. Data were analyzed descriptively using means and standard deviations, ranks and sum of ranks. Null hypotheses were verified at 0.05 level of significance using t-tests and Mann-Whitney U-test. Results revealed asignificant difference in the academic achievement of subjects exposed to the animated media strategy and those taught using lecture. There were also significant differences in the retention and interest of subjects exposed to the same strategy and those taught using conventional method. The subjects in the experimental group developed a significantly high positive interest than subjects in the control group. The study revealed no significant difference in the academic achievement, retention and interest of male and female students exposed to animated-media strategy. From the findings of the study, it was recommended among others, the need for Federal and State Ministries of Education to provide computers and projectors for teachers to facilitate their teaching with animations. Gambari, Falode and [49] examined the effectiveness of computer animation and geometrical instructional model on mathematics achievement and retention among junior secondary

school students. The purpose of the study was to investigate the effectiveness of computer animation and geometry instructional model on mathematics achievement and retention on Junior Secondary School Students in Minna, Nigeria. It also examined the effect of gender on students' achievement and retention. Four hypotheses were tested in the study. The research design was a pre-test post-test experimental and control group design. 40 junior secondary school students were drawn from two secondary schools within Minna metropolis. The instrument for data collection was Geometry Achievement Test (GAT). The reliability coefficient of 0.87 was obtained using Kuder-Richardson (KR-20) was established after the instrument was validated by experts. GAT was administered to students as pre-test and post-test. The students' pretest and post-test scores were analyzed using t-test statistics. The results indicated that the students taught geometry using computer animation performed significantly better in posttest and retention test than their counterparts taught geometry using instructional model and aconventional method respectively. However, there was no significant difference reported in the post-test performance scores of male and female students taught geometry using computer animation and instructional model respectively. These findings indicated that geometry concept in mathematics could be taught and learnt meaningfully through the use of computer animation.

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' retention in chemistry when compared to those taught using conventional method using their pretest and posttest mean scores?

Table 1: Pre-Test and Posttest Mean Retention Scores of Students taught Chemistryusing Animated-media strategy and Conventional method

Groups	N	Posttest Mean	Delayed Posttest Mean	Loss in Mean	Decision
Animated-media	77	74.92	56.17	18.75	Effective
Conventional method	45	76.02	35.07	40.95	

Table 1 shows that the animated-media group had loss in mean score of 18.75 while the conventional group had loss in mean score in retention of 40.95. With less loss in mean score, animated-media was effective for enhancing students' retention.

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

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

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1275.471[a]	2	637.736	13.596	.000
Intercept	7953.230	1	7953.230	169.554	.000
Posttest	.686	1	.686	.015	.904
Method	1203.538	1	1203.538	25.658	.000
Error	5581.906	119	46.907		
Total	195238.000	122			
Corrected Total	6857.377	121			

Table 2 shows that there was a significant main effect of the treatment which accounted for 17 percent of the variance in the retention scores of the students, F (1, 121) = 25.658, P (0.00) <0.05. Thus, the null hypothesis was rejected. Therefore, effect of animated-media instructional strategy on students' retention in chemistry is significant when compared to those taught using conventional method using their pretest and posttest mean scores. Effect of animated-media instructional strategy on students' retention in chemistry is significant compared to those taught using conventional method using their pretest and posttest mean scores.

Effect of Animated-Media Instructional Strategy on the Learning Retention of Students

The findings of the study revealed that animated-media strategy significantly improved the students' retention of learning materials. Similarly, there was no significant difference in the mean achievements of male and female students taught using animated media strategy. Thus, the use of animated-media strategy proved effective for both male and female students. [50] pointed out, the use of such innovative strategy as animated-media strategy enables learning information to be processed along distinct channels of the memory. The interactions of both the temporal and permanent memory stores and integration of learning materials with previous knowledge facilitates proper retention of learning materials. The retention proceeding from the use of animated-media strategy is also a function of proper organization of learning concepts common with strategies that involve many senses [51]. The findings of this study lend credence to the study of [52] who found out that

technology for learning which involve computer animation significantly improved retention. The finding of the study is also in line with that of [53] who reported that animated media significantly and positively improved achievement.

CONCLUSION

The findings of this study revealed that animated-media strategy positively enhanced students retention and interest in chemistry. This implied that the animated-media strategy is effective for teaching chemistry concepts. Chemistry teachers should make recourse with animated-media software and develop animated media models to be used in the process of instructional delivery.

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