EFFECT OF DIGITAL VIDEO INSTRUCTION ON SENIOR SECONDARY SCHOOL STUDENTS ACHIEVEMENT IN CHEMISTRY IN MINNA

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Abstract

The study examined the effects of digital video instruction on students achievement in chemistry. The design adopted for the study was the pretest-postest, experimental and control group design. 120 students from senior secondary school class two (SSII). Two schools were randomly selected from sixteen senior secondary schools in Minna that offers chemistry. The two schools were assigned experimental and control groups. The instrument for data collection was the Chemistry Achievement Test (CAT). This instrument was administered as pretest and posttest. The data were analyzed using t-test statistics. Two research hypotheses were tested at 0.05 significant level. From the analysis the following findings were reached (1) The use of digital video instruction significantly improved the students achievement in chemistry as the mean scores of the experimental group on posttest was higher than that of the control group ($t=32.13$, $df=117$, $p<0.05$). (11) The male students achieved higher than their female counterpart in the experimental group. ($t=3.14$, $df=29$, $p<0.05$). Based on these findings it was recommended that the use of digital video for teaching chemistry at senior secondary schools should be encouraged.

Introduction

Science and technology education are critical to national development and the sustenance of such development. The world of today is dominated by science and technology, so much so that almost everything is now scientific and technological in nature. Technological artifacts and processes have so dominated the home, workplace, and indeed the totality of the environment that everybody needs at least, basic knowledge of science and technology to contribute to development efforts and to at least, survive if not succeed in the society of today. This implies that science and technology education should be accessible to all citizens for conducive living in the modern society of today (Njoku, 2009).

Successive Federal and State Governments in Nigeria had made frantic efforts to improve the status of science teaching in Nigeria. Salami (2003), summarized government efforts to integrate and intensify science and technology values in Nigeria education system to include

(i) Establishment of several unity and special science schools, vocational and technical schools in some states.
(ii) Establishment of technical workshops in secondary and technical schools.
(iii) Establishment of Federal Universities of Technology and Agriculture.

Chemistry is the study of matter, its structure transformations, interactions and the energy consequences of the interactions and transformations. It is one of the science subjects that is offered in the secondary and tertiary institutions in Nigeria. Ezenwa, (1999) suggested that the quality of science especially chemistry teaching and learning can be improved through the use of appropriate instructional media. In science most of the concepts are acquired during instruction. The instructional strategy employed by the teacher plays an important role in concept acquisition and meaningful learning.

Chemistry is one of the science subjects which have been taught using different methods for instance, Ifeakor, (2005) used commercially produced Computer Assisted Instructional package to teach chemistry, while Olorundare, (2009) used Concept mapping and analogy to teach chemistry yet student's performance in chemistry is not encouraging. The reasons for poor performance in chemistry as identified by the following researchers include: poor instructional

strategies (Bajah, 2000; Olorukooba, 2007); abstract nature of science concepts (Nsofor, 2006; Ojiaku, 2003); lack of qualified teachers (Biodun, 2004); poor infrastructure and inadequate laboratory facilities (Shalw, 2003); and non-availability and utilization of instructional materials (Yusuf, 2004). Also the chief examiner, West African Examination Council (WAEC, 2007), identified some areas of weaknesses of the students/candidates which were reported as a contributing factor to student's poor performance. The areas identified include: Poor understanding of general principles and concepts, heat, energy changes, rates of chemical reactions, reversibility of reactions and chemical equilibrium.

Despite all the effort made by the Federal government, chemistry teachers and researchers, students perform very poorly. In order to improve the teaching and learning of chemistry the researcher is of the view that the use of digital video to teach chemistry may lead to better performance by the students.

According to Nwoji (2000) video instruction can transmit verbal and non-verbal kinds of information since video instruction is a multi-media instruction with the combination of Audio and Visual materials, and that video offers a reality of experience that stimulates self-activities on the part of the students. It develops the continuity of thought. Video instruction is a form of non-directive teaching techniques. The teacher produces an instructional video package which is played on a video player connected to a television monitor which is put on, for the learner to view. At interval he may choose to stop playing and explain certain points or factors or probably wait till the end of the lesson. Learners have the opportunity to view the production over and over again (Orisabiyi, 2007).

Significance of the Study

The result of this study will have positive impacts on teaching and learning of chemistry in secondary schools, as it will re-emphasize the need for teachers to always enrich the teaching and learning process with instructional media. This will encourage head, hand and heart co-ordination and promote harmonious interaction between learners and materials to be learnt. This in turn would relieve passivity, monotony, excessive verbalism, thereby preventing chemistry from being taught in a manner that produces in the mind of learners a feeling of boredom and distaste for chemistry.

Research Questions

The study was guided by the following questions

(i) What is the effect of digital video instructional strategy on secondary school student's achievement in chemistry?

(ii) What is the influence of gender on secondary school student's achievement in chemistry using digital video instructional strategy?

Research Hypotheses

The following research hypotheses were formulated:

HO_1: There is no significant difference between the mean achievement scores of students taught chemistry using digital video instruction and lecture method.

HO_2: There is no significant difference in the mean achievement scores of male and female students in the experimental group taught chemistry using digital video instruction.

Methodology

Design of the Study: The research design adopted for this study is a quasi-experimental design. It is a pre test; post test, experimental and control group design

Sample and Sampling Techniques: The sample for this study is made up of 120 students (60 males and 60 females) from two randomly selected senior secondary schools in minna. A two-stage sampling technique was adopted. Firstly, a purposive random sampling was adopted to

obtain two secondary schools in Minna, Niger State. The schools were purposefully sampled based on equivalence in (laboratories, facilities and manpower), school location (urban area, Minna metropolis), gender composition (mixed schools). Secondly, the two sampled equivalent and co-educational/mixed schools were randomly assigned to experimental and control groups using simple random sampling technique and in each school 30 males and 30 females were randomly selected. The experimental group was treated using Digital Video Instruction (DVI) while the second equivalent and co-educational school was used for control group and were taught using the Lecture Method (LM).

Instrument for Data Collection: The instrument used in collecting data for this study is researcher adopted Chemistry Achievement Test (CAT). The Chemistry Achievement Test (CAT) consisted of 50 multiple choice items adapted from past examination questions of West African Examination Council (WAEC) and National Examination Council (NECO). The Chemistry Achievement Test (CAT) was based on SSII curriculum on the concept of (i) energy effects (ii) chemical equilibrium (iii) reversibility of reaction and (iv) le chatelier's principle. These chosen topics were selected from the senior secondary two (SSII) chemistry syllabuses and scheme of work corresponding to what the students should be taught in their schools at the time of the study. Each item of the instrument was a multiple choice question with four options (A-D) as possible answers to the question. Only one of the four options will be the correct answer.

Validation of the Digital Video Instructional Package on Chemistry: The package was given to educational technology experts and three chemistry teachers from secondary schools. They were to determine the appropriateness of the package for teaching the chosen topics/units, clarity and simplicity of the package as well as its suitability for the level of the students, the extent of coverage and possible errors in the structuring of the package. The package contained lessons presented on the following topics (i) energy effects (ii) chemical equilibrium (iii) reversibility of reaction and (iv) le chatelier's principle.

The Chemistry Achievement Test (CAT): CAT was given to four chemistry education experts and three senior chemistry teachers from secondary schools. These experts assessed the face and content validity of the instrument in relation to the background of Secondary School Students (SSII).

Reliability of Instrument: A pilot test was conducted using thirty (30) students which were randomly sampled from Bosso Secondary School in Minna to ascertain the reliability and suitability of the chemistry achievement test instrument. Though this sample is in the population of this study it is not within the sample for this study. The chemistry Achievement Test (CAT) was administered once. The result of the test was analyzed using the Kuder-Richardson formula (K-R 20). A reliability coefficient of 0.95 was obtained.

Method of Data Collection: The instrument for data collection in this study (CAT) was administered to the students before the experimental treatment. The students' scores in this first administration served as pretest scores of the study. After the pretest, the treatment commenced and lasted for four weeks. At the expiration of the treatment, the items of this instrument were reshuffled, produced in yellow coloured question paper and were re-administered to the students. The scores obtained from the second administration served as post-test scores in the study. The essence of item reshuffling and change of the colour of the question paper is to distract the students from realizing that they had responded to items in the instrument before.

Method of Data Analysis: The data collected from the pretest and posttest were analyzed using means, standard deviation and t-test. The significance of the various statistical analyses was ascertained at 0.05 alpha levels.

Results

Table 1: t- test comparison of the pre-test mean score of experimental and control groups

Group	N	df	Mean	SD	t-Cal	P
Experimental	60	117	32.14	2.75	0.25^{NS}	0.802
Control	60		32.27	2.63		

NS: Not significant at 0.05 level

t-test analysis of students pretest scores of experimental and control groups revealed that there is no significant difference(t= 0.25; p> 0.05). This shows that the initial mean scores of the two groups were equivalent and that the subjects of this study were comparable.

Table 2: t-test comparison of the post test mean score of experimental and control groups

Group	N	df	Mean	SD	t-Cal	P
Experimental	60	117	68.47	4.40	32.13*	0.000
Control	60		40.77	4.98		

Significant at 0.05 level

The result of the analysis in table 2 shows the posttest achievement scores of experimental and control groups. The posttest mean scores are 68.47 for experimental group and 40.77 for control group. The experimental group had higher mean score than the control group (t=32.13: p< 0.05) hence, the null hypothesis is not accepted indicating that there is significant difference between the achievement of experimental and control groups.

Table 3: t- test comparison of the post test mean score of male and female students in experimental group

Group	N	df	Mean	SD	t-Cal	p
Male	30	29	70.13	4.42	3.14*	0.004
Female	30		67.00	3.88		

Significant at 0.05 level

The result of the analysis in table 3 shows the posttest achievement scores of male and female experimental group. The posttest mean scores are 70.13 for male and 67.00 for female experimental group. The male group had higher mean score than their female counterpart (t=3.14: p< 0.05) hence, the null hypothesis is not accepted indicating that there is significant difference between the achievement of the male and female experimental group.

Discussion

The study examined the effects of digital video instruction on students achievement in chemistry. The result of the t-test analysis on the achievement of students in the experimental and control groups revealed that the students in the experimental group achieved higher than those in the control group. This result is in line with the findings of Nwoji, 2000 and Orisabiyi, 2007 who found that students achieved higher in introductory technology and biology when video instruction is used on students.

Hypothesis two was not accepted signifying that there was a difference in the achievement of male and female students in the experimental group. The result show that the male students achieved higher than their female counterpart in the experimental group. This result is in agreement with Orisabiyi, 2007 who found that the male out performed their female counterpart in biology using videotaped instruction.

Conclusion

The result of the study revealed that students taught with digital video package scored significantly higher in the Chemistry Achievement Test (CAT) than those taught without it. The package had effect on the male students than their female counterpart in the experimental group. Digital video instruction improved the learning of chemistry; hence its use should be encouraged by stakeholders in the education sector.

Recommendations

Based on the findings of this study, the following recommendations were made:

(i) Stakeholders in the education sector should regularly organise workshops and seminars for science teachers on the use of digital video for instruction.

(ii) Parents should be encouraged to buy digital video disks which contained educational instructions.

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