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EFFECTIVENESS OF VIDEO-MEDIATED INSTRUCTION ON TEACHING SECONDARY SCHOOL PRACTICAL CHEMISTRY IN AKURE SOUTH LOCAL GOVERNMENT AREA OF ONDO STATE, NIGERIA

Ominowa, Olajumoke Toye[1],
Bamidele, Emmanuel Folorunso[2i]
[1,2]Faculty of Education
Obafemi Awolowo University, Ile-Ife, Nigeria

Abstract:
This study examined the relative effectiveness of Video Mediated Instruction (VMI) and Classroom Demonstration Technique (CDT) on the performance of students in practical Chemistry and also determined the effectiveness of these modes of instructions on the retention ability of the students. A pre-test, post-test control group design was used for the study. The population for the study comprised of Senior Secondary School Chemistry Students in Class Two (SSSII) in Akure South Local Government Area of Ondo State. A sample of eighty eight of the SSS II Chemistry students in two intact classes from two randomly selected secondary schools in the LGA was used for the study. The two intact classes were randomly assigned to the treatment and control groups. The treatment group was taught with Video Mediated Instruction (VMI), while the control group was taught with the Classroom Demonstration Technique (CDT). A pre-test was administered before treatment to determine the entry level of the students in the two groups. The teaching lasted for four weeks after which a post-test was administered. Two weeks later, a retention test was then administered. The data obtained were analysed using t-test statistics. The results showed that there was a significant difference in the performance of students in the two groups. Students taught with VMI performed significantly better than those taught with CDT only (t =, $p<0.05$) Also, there was a significant difference in the effectiveness of VMI in enhancing retention ability of students in practical Chemistry. The study concluded that VMI was

[i] Correspondence: email bamdeleef@yahoo.com

effective in teaching practical chemistry (Volumetric Analysis) and that integrating CDT with VMI will enhance students' learning.

Keywords: video mediated instruction, classroom demonstration technique, mediated instruction, instructional package

Introduction

Chemistry, one of the major science subjects taught in Nigerian secondary schools, it stands as a pre-requisite for admission of students into science based courses in the tertiary institutions. A credit pass in the subject in the Senior Secondary Certificate Examination (SSCE) is required for admission into such courses. This shows how important and relevant the subject is to science students and potential scientists. The contribution of Chemistry and chemists to social, economic and industrial life of the world cannot be over-estimated so the nation cannot afford to toy with the teaching and learning of the subject.

However, as important as the subject is, the performance of Nigeria students in the subject at the secondary school remain a dismal failure as attested by West African Examination Council. Table I below summarizes the enrolment and performance of students in the West African School Certificate Examination May/June 2008-2013.

Table 1: Trends of Performance in Chemistry in the West African Senior School Certificate Examination May/June 2008-2013

YEAR	TOTAL ENTRY	TOTAL EXAMINED	TOTAL ABSENT	NUMBER AND PERCENTAGE WITH GRADES		
				CREDIT 1-6	PASS 7 & 8	FAIL 9
2008	468291	456993	11298	198621	121139	116892
		(-97.58%)	(-2.41%)	(-43.46%)	(-26.50%)	(-25.57%)
2009	478235	468546	9689	204725	114697	110260
		(-97.97%)	(2.03%)	(-43.69%)	(-23.41%)	(-25.39%)
2010	568291	565643	11930	236059	109944	98165
		(-97.50%)	(-2.50%)	(-50.70%)	(-23.61%)	(-26.08%)
2011	575757	565692	10065	280250	151627	129102
		(-98.25%)	(-1.75%)	(-49.54%)	(-26.80%)	(-22.82%)
2012	641622	627302	14320	270570	192773	148344
		(-97.77%)	(-2.23%)	(-43.13%)	(-30.73%)	(-23.65%)
2013	649524	639131	10393	460470	95030	61340
		(-98.40%)	(-1.60%)	(-72.05%)	(-14.87%)	(-9.60%)

Source: West African Examination Council, Nigeria

From this result, it can be seen that only in 2010 and 2013 that candidates' performances were up to 50% at credit level. In the other years, performances were below 50%.

In Nigeria evidence abound from the past studies that the negative attitudes of secondary school students towards learning of Chemistry have affected their academic performance in the subject in WAEC. They believed that it is too abstract, uninteresting, unreal and difficult to comprehend. This is as a result of the instructional strategies employed in the teaching of the subject (Bamidele and Oloyede, 2013; Irinoye, Bamidele, Adetunji and Awodele, 2015), lack of qualified teachers, poor infrastructure facilities, inadequate instructional materials, shortage of laboratory facilities, inadequate and improper exposure to laboratory activities and lack competencies in the handling of Chemistry practical have been found to reduced students' interest (Adeyegbe, 1997; Ikeobi, 1999; Bajah, 2000; Oloyede and Bamidele, 2002; Avaa, 2007; Jegede, 2007; Gambari, 2010; Edomwonyi-Otu and Avaa, 2011; Adeyegbe, 1997).

The lack of qualified Chemistry teachers has been found to be a serious problem in Chemistry teaching. Ikeobi (1999) lamented that during a marking exercise, there are situations where candidate's volumetric analysis titration values could not be marked because the teacher's titre values differed widely from those of the students and in some cases teachers' titre values were so outrageous that they were discarded and the examiner was left with no choice than to find the mean of all the students titre values before he could mark the students' scripts, indicating that some Chemistry teachers did not understand titration procedure. Practical work in Chemistry laboratory has been identified as central to the effective teaching and learning of Chemistry. (Adetunji, Oloyede, Bamidele and Bada, 2012). Chemistry, as a physical science can be taught and learned most effectively if its teaching involves hands – on and mind-on or activity – centered or subject-centered, rather than lecture method or "*chalk and talk*" method which is teacher–centered. In line with this, the secondary school curriculum recommends the use of discovery or inquiry approach of teaching to Chemistry which is basically on practical work in the laboratory. Laboratory experiences are so important that the examination bodies like National Examination Council (NECO) and West African Examination Council (WAEC) assessed learners' competency in the practical aspect of the subject as part of the final year examination in secondary schools.

Researchers have worked on the importance of laboratory in Chemistry education. Ogunmade (2006) pointed out that practical helps in facilitating learning and to reinforce the principles being studied in Chemistry. He also pointed out that Chemistry practical helps students to develop certain skills such as measuring and accuracy. Reid, Zhang and Chen (2003) enumerated the general importance of

laboratory. According to them, it supports theoretical knowledge, helps the students experience the pleasure of discovery and development of psychomotor skills, increase creative thinking skills and allow students to apply the skills instead of memorizing.

Since, all aspects of Chemistry teaching require the practical demonstration to reinforce learning and motivate developments of scientific attitudes in the students. However, science teachers are faced with challenges of poorly equipped science laboratories. Oloyede and Bamidele (2002) suggested the use of computer assisted instruction in the teaching/learning of practical Chemistry in which students can understand and learn Chemistry better with the required exposure to the practical trainings in the absence of real and well equipped laboratory. The interest-getting device instructional resources were capable of enhancing performance, retention and interest of the students in the subject.

Such interest-getting instructional approaches, according to Adegoke (2010), Chuang (1999), Mayer, Dow, and Mayer (2003), involves multimedia presentations of explanations in visual and verbal formats such as presenting a computer-generated animation synchronized with narration or on-screen text. According to them, the media makes learning more permanent and offer experiences which promote self-activity on the part of the students. Also, nothing absolutely new is ever learnt effectively with one exposure. Repetition helps to reinforce and extend learning and to make the learned information more enduring (Thorndike, 1932). Video mediated instruction allows repetitive viewing; the learner can view repeatedly until the concept being taught is well understood.

In Video Mediated Instruction, practical skills are taught using video. The video links the audio and the visual together to provide a multisensory experience for the learner for maximal understanding. Learners can play, replay, pause and rewind to specific section of the experiment and this aids practice and rehearsal which is so important in developing competency. Hence the learner has control over the process of learning.

In Nigerian secondary schools the most common method employed by Chemistry teachers is teacher–centered and is referred to as Classroom Demonstration Technique which involves the students sitting, listening and watching the teacher deliver the theoretical concept after which the teacher demonstrates the practical aspect to the students to see. Sometimes the students surround the teacher to see clearly and this method may not be too good enough for science practical experiments especially when dealing with hazardous reactions which may explode.

The use of video in the delivery of practical lesson is acknowledged in the literature. Ogunleye (2002) reported that in the era of technological advancement,

technology has minimum impact on education. This is because 80% of the teachers in Nigeria are mostly using the chalkboard and textbook methods. Mishra (2001), Adetunji et al (2012) observed that video is useful to show practical and real life activities and that video can be used to present hazardous and costly experiments in real time and for repeated use. Since not every teacher is aware of the use of video for teaching Chemistry practical in Nigeria. Thus, much remain to be empirically studied on the effect of video mediated instruction in Chemistry education in Nigeria. It is against this background that the study investigates effectiveness of Video Mediated Instruction in learning practical Chemistry.

Purpose of Study

The purpose of the study is to examine the effectiveness of video mediated instruction in teaching practical Chemistry. The specific objectives of the study are to:

a. investigate the effectiveness of Video Mediated Instruction (VMI) and Classroom Demonstration Technique (CDT) on the performance of students in practical Chemistry;
b. examine the relative effectiveness of the two methods on retention of learning concepts in practical Chemistry.

Research Hypotheses

The following research hypotheses were raised and tested based on the objectives of the study:

1 There is no significant difference in the performance of students taught practical Chemistry using video mediated instructions (VMI) and classroom demonstration Technique (CDT).
2 There is no significant difference in the retention ability of students in practical Chemistry when taught with VMI and CDT.

Methodology

The study adopted the non-equivalent pre-test post-test control group design. The subjects were randomly assigned to two groups i.e. experimental and control groups. The design is represented as:

$O_1 \quad X_1 \quad O_2 \quad O_3$
$O_4 \quad X_2 \quad O_5 \quad O_6$

Where 'O' stands for observation and X for treatment.

The population for the study comprised of Senior Secondary School Chemistry Students in Class two (SSSII) in Akure South Local Government Area of Ondo State. A sample of eighty eight of the SSS II Chemistry students in two intact classes from two randomly selected secondary schools in the LGA was used for the study. The two intact classes were randomly assigned to the treatment and control groups. The treatment group was taught with Video Mediated Instruction (VMI), while the control group was taught with the Classroom Demonstration Technique (CDT). Table 2 below shows the number of students in each school and the treatment assigned.

Table 2: Schools and Treatment Assigned

Group	Name of School	Number of Students	Treatment Assigned
1	St. Francis High School, Akure	46	VMI
2	St Micheal's Catholic High School, Akure	42	CDT
Total		**88**	

Instruments

One instrument was used for the study. The Chemistry Achievement Test (CAT).
The CAT consisted of twenty items multiple choice test with four options A, B, C and D which was used for the pre-test, post-test and retention test. This consisted of questions on relevant apparatus, indicators, experimental procedures and calculations. The difficulty index of the items selected ranges from 0.25 to 0.75. The reliability coefficient of the test was 0.78 which was obtained using Kuder Richardson formula 21(KR-21), indicating that the instrument is reliable.

Data Collection Procedure

The research was carried out in three different stages and data were collected at each stage. The stages are the pre-treatment stage, the treatment stage and the post treatment stage. At the pre-treatment stage, the researchers visited the selected schools for permission and solicited for the school's and students' cooperation. The first week was used to administer pre-test to the participating students in each school. The actual teaching started in the second week to the fifth week of the study. An instructional package containing multisensory motion picture (VMI) connected to visual device (projector) to present Chemistry practical lesson for experimental group students.

The students in the control group were taught using conventional teaching method (Classroom Demonstration Technique (CDT)). In each of the groups there were four sessions (i.e. one session per week). Each session lasted 1hr 20minutes.

At the post-treatment stage which was the last week of the experiment, the CAT was administered to both the experimental and control group students. This was followed by the retention test which took place after two weeks of administering the post test. The scores of the students in the pre-test, post-test and retention test were subjected to t-test statistics.

Results

The Chemistry Achievement Test (CAT) administering prior to the treatment was to ascertain the background knowledge of all the students in practical Chemistry and the data obtained was subjected t-test statistics and the result is presented in table 3 below.

Table 3: Analysis of the pre-test scores of the two groups

Group	N	$\overline{X}$	S.D	df	t_c	t_t
VMI	46	6.20	9.23	86	1.05	1.99
CDT	42	5.50	6.49			

Result displayed in table 3 showed that t = 1.05, @ p < 0.05 meaning that there was no significant difference in the performance of the students in all the groups since $t_c < t_t$. This shows that the students have similar background knowledge in volumetric analysis.

Testing of the Hypotheses

Hypothesis One

Hypothesis one states that there is no significant difference in the performance of students taught practical Chemistry using video mediated instructions and classroom demonstration technique.

In testing this hypothesis, the post-test scores of students exposed to VMI were compared to the post-test scores of students exposed to CDT using t-test statistics as presented in Table 5.

Table 4: Analysis of the post-test scores of the two groups

Group	N	$\overline{X}$	S.D	df	t_c	t_t
VMI	46	11.35	2.99	86	2.30	1.99
CDT	42	9.95	2.68			

Result from table 4 showed that, t = 2.30, at p < 0.05. Since $t_{cal} > t_{tab}$., it implies that a significant difference existed in the performance of the students taught volumetric analysis using VMI and CDT. The null hypothesis is hereby rejected. The VMI group performance is better than the CDT group. The mean score of VMI group is higher than that of CDT group.

Hypothesis Two

There is no significant difference in the retention ability of students in practical Chemistry of students taught with VMI and those taught with CDT.

In testing this hypothesis the post test scores of students exposed to VMI were compared with the post-test scores of students exposed to CDT using t-test statistics as presented in table 5.

Table 5: Analysis of the Retention Test Scores of VMI and CDT Groups

Group	N	$\bar{X}$	S.D	df	t_c	t_t
VMI	46	9.35	1.65	86	3.13	1.99
CDT	42	8.20	2.30			

Result from table 5 showed that, the value of t= 3.13 at 0.05 probability level was significant. The null hypothesis is hereby rejected. The VMI group was able to retain the concept taught better than the CDT group since the mean value of VMI is higher than that of CDT.

Discussion

The finding of this study revealed that the use of Video Mediated Instruction (VMI) enhance students understanding of Chemistry concepts, acquisition of skills, retention ability and improve their performance in the subject. The effectiveness of VMI was due to its characteristics of captivating and holding the attention of the students during classroom presentation. The instructional media is highly interactive and effective in enhancing better retention of what was learnt. The students have the opportunity of repeating the teaching-learning process until they were able to master the concepts and skills required in volumetric analysis. Thus it provided the experiences not easily obtained through conventional methods.

The findings of this study is consisted with those of Adetunji, Oloyede, Bamidele and Bada, (2012) and Jasper and John, (1998) they concluded that the combination of video media with the conventional methods allows the students to utilize the demonstration shown by the teacher during the classroom demonstration technique to

practice many times with the video media. They provided a stimulating environment which allowed for practice and interaction among the students. The study also agreed with those of studies of Oloyede & Bamidele (2002), Afolabi, (2006), Yusuf and Afolabi (2010), they asserted that instructional media in teaching/learning do not only enhance communication between learners and teachers but also aids retention.

Conclusion and Recommendations

The study concluded that Video Mediated Instruction could be used in teaching/learning of practical Chemistry to guide both teachers and students. In order to enhance Chemistry teaching and learning Video Mediated Instruction should be encouraged in teaching Chemistry concepts. There are a large number of resources on the internet which classroom teachers could access and used to teach various concepts in the sciences. Subject teachers are therefore encouraged to access these online teaching resources for teaching difficult topics in the subject. Also educational technologists should be encouraged to develop varieties of Video Mediated Instructional packages and computer assisted instructional resources on topics in secondary schools Chemistry curriculum.

References

1. Adegoke, B. A. (2010). Integrating animations, narrations and textual materials for improving students' learning outcomes in senior secondary school physics. *Electronic Journal of Research in Educational Psychology*, 8(22) 725-748.
2. Adetunji, A.A., Oloyede, E.O., Bamidele, E.F. & Bada, T.A. (2012).Comparative Effectiveness of Video Media Instruction and Laboratory Teaching Technique in Learning Practical Chemistry in Nigeria Senior Secondary Schools. *Journal of Educational and Social Research,* 2(2) 331-33.
3. Adeyegbe, S.A. (1997). "A Review of Chief Examiners Reports on SSCE May/June 1994 Chemistry Examination papers". *STAN Annual National Chemistry Workshop Proceedings held at Minna March* 24- 28.
4. Afolabi, A. O. (2006). Effect of a computer assisted instructional package on secondary school student's performance in Biology, in Oyo, Nigeria. Thesis presented to the Department of Science Education, University of Ilorin.
5. Avaa A. (2007). Improving performance in the sciences. *A support paper presented at a workshop held at Federal Government Girls' College Zaria*.

6. Bajah, S. T. (2000). The state of science technology and mathematics education in Africa. *UNESCO International Science, Technology & Environmental; 25*(3/4), p5.
7. Bamidele, E. F. & Oloyede, E. O. (2013). Comparative Effectiveness of Hierarchical, Flowchart and Spider Concept Mapping Strategies on Students' Performance in Chemistry. *World Journal of Education, Vol. 2, No. 5. Canada*
8. Chuang, Yea-Ru (1999). Teaching in a multimedia computer Environment: A study of the effects of learning style, gender and math achievement. Interactive Multimedia Electronic Journal of Computer – Enhanced Learning. Retrieved December 15, 2000 from http://ime.wfu.edu/articles/1999/1/10/index.asp.
9. Edomwonyi-Otu,L. & AVAA, A. (2011). The challenge of effective teaching of Chemistry: A Case Study. *Leonardo Electronic Journal of Practices and Technologies,* Issue 18, p. 1-8.
10. Gambari, I. A. (2010).Effect of computer-supported cooperative learning strategies on the performance of senior secondary students in physics, in Minna, Nigeria. *Unpublished PhD thesis, University of Ilorin, Ilorin, Nigeria.*
11. Ikeobi, O.I (1999). "Talk back" *Science Teachers Association of Nigeria*, Bulletin 3, (1), 6 – 7.
12. Irinoye, J. Bamidele, E. F., Adetunji, A. A. & Awodele, B. A. (2015). Relative Effectiveness of Guided Inquiry and Demonstration Methods on Students' Performance in Practical Chemistry in Osun State Secondary Schools. *Advances in Social Sciences Research Journal, Vol 2, No, 2. DOI: http://dx.doi.org/1014738/assrj.21.2015. United Kingdom.*
13. Mayer, R.E., Dow, G.T., & Mayer, S. (2003). Multimedia Learning in an interactive self-explaining environment: what works in the design of agent-based micro worlds? *Journal of Educational Psychology*, 95, 806-813.
14. Mishra, A. J. (2001). Video a Learning tools in science class. *Educational Technology Journal*, 1 (1), 124-132.
15. Ogunleye, B.O. (2002). Evaluation of the Environmental Aspect of The Senior Secondary School Chemistry Curriculum in Ibadan, Nigeria. *Unpublished Ph.D. Thesis University of Ibadan, Ibadan.*
16. Ogunmade, T.O (2006). Quality of Secondary Science Teaching and Learning of Secondary Science Teaching and Learning of Secondary in Lagos State, Nigeria.
17. An Unpublished Doctoral Thesis, Edith Cowan University, Perth, Western Australia.
18. Oloyede, E. O. & Bamidele, E.F. (2002). Effectiveness of a computer assisted instruction in the Teaching of secondary school practical Chemistry. *Ife Journal of Theory and Research of Education.* 7(1) 2012 Pg. 52-59.

19. Reid, D. J., Zhang, J., & Chen, Q. (2003). Supporting scientific discovery learning in a simulation environment. *Journal of Computer Assisted Learning, 19*, 9-20.
20. Thorndike, E.L. (1932). Fundamentals of Learning. New York; Bureau of publication. Teacher College Columbia.
21. Yusuf, M. O., & Afolabi, A. O. (2010). Effects of computer assisted instruction (CAI) on secondary school students' performance in Biology. *The Turkish Online Journal of Educational Technology* 9 (1) 62-69.