Video Instruction as a Literacy Package for Teaching Science in Inclusive Classrooms

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ABSRACT

This study investigated the effects of video instruction (as a literacy package) on the performance of students' in selected abstract basic science concepts in an inclusive classroom in Jos, Nigeria. The study adopted a pretest-posttest non- equivalent control group, quasi-experimental design. Using purposive sampling technique, one inclusive school was select from 21 public junior secondary schools in Jos North Local Government Area of Plateau State. One hundred Junior Secondary School One (JSS1) students from the school constituted the sample. Two intact classes took part in the study as the experimental and control groups respectively. Both groups undertook pre-tests on BSCPT before exposure to different methods of teaching. After six weeks of teaching exercise, the experimental and the control groups undertook to a post-test on BSCPT. The experimental group was taught using video instruction the while the control group was taught using the conventional method. Data collection involved the use of Basic Science Concept Performance Test (BSCPT) with a reliability coefficient of 0.72. Three research questions were proffered and three hypotheses were tested. Data presentation involved frequencies and percentages and t-test to test the hypotheses at $\alpha = 0.05$ level of significance. Results of the study indicate that students taught using video instruction out-performed their counterparts taught using the conventional method. There was no significant difference in mean scores of performance between boys and girls taught using video instruction. There was no significant difference mean scores of performance between regular children and those of disabled (slow learners) exposed to video instruction. The study recommends video instruction and other effective and innovative strategies for use by basic science teachers in inclusive classrooms.

Introduction

Science occupies a unique position in the life of every individual and the society in general. It plays an indispensable role in the technological development of any nation.

Today, science has permeated all facets of human endeavour, in daily business, communication and leisure activities, Pharmacy, Engineering and Architecture. In view of the recognition of the importance of science to national development, the Federal, Government of Nigeria in its National Policy on Education (Federal Ministry Education 2009) accorded a compulsory status to science at the basic and secondary school levels of education. This ensures that students get a good start for further studies in science from the very basic/foundational level of education.

Despite the universal acknowledgement that science in the development of society is indispensable, effective teaching and learning of science is continuously confronted with problems. This is manifested in students' poor performance in sciences in public examinations, such as, the West African Examinations Council (WAEC) (Chukwuneke & Nwachukwu, 2005; Udofia, 2011; WAEC, 2011).

A survey of the achievement of students in science at the basic level of education also depicts a sad story. Ozoji (2010) reports the poor performance outcomes of students in basic science in Junior School Certificate Examinations in one of the States in Nigeria, in which students performed dismally for five consecutive years.

Science educators have been concerned with the way students learn science. These include method of teaching and use of literacy materials that enhance the learning process, means of identifying and overcoming difficulties encountered in learning science, and ways of providing for individual differences in students. Many Nigerian basic and secondary school students are poor readers and have difficulties

comprehending their textbooks and supplementary materials in science (Udofia, 2011). Moreover, science textbooks are not affordable for the average Nigerian parent due to high cost. Furthermore, literature evidence shows that Nigerian students perceive basic science concepts as abstract and difficult to understand. Such concepts include 'solar system' and 'man in space' (Akinmade, 1992; Ncharam, 2000; Ozoji, 2010).

Gender is also implicated in science performance. Results of the West African Examinations Council in Nigeria by subject, grade and gender show that girls had lower performance outcomes in science subjects than boys and, that, the disparity is more in physical sciences than in biological sciences (WAEC, 2004). However, the findings of Uguma and Akpama (2005) show no difference between the performance of male and female students in science.

One of the aspects of learning which appears to have been neglected in science instruction in Nigeria; but which enhances science teaching and learning is the use of technologies, such as video instruction. Instead, the prevalent teaching method used in science classrooms as shown by studies is the traditional lecture method, which is ineffective, hinders meaningful learning of science concepts and principles, and, results in poor performance outcomes by students (Ada, 2003; Adejoh, 2006). There is compelling need to employ more dynamic and result-oriented methods backed by media facilities such as video instruction in science teaching and learning.

According to Ijiga (2010), video instruction refers to a teaching – learning interactive process whereby learnable tasks are presented to learners via video and television. Various studies report about the efficacy of video instruction in enhancing teaching and learning of school subjects. Offorma (2012) opines that video and television resources present language more comprehensively than any other instructional material, in that, they combine pictures and sound in a sequence as experienced in real life. A study by Ijiga (2010) indicates that video instruction is effective in teaching English as a foreign language for young and adult learners. Other studies worldwide that have investigated the effects of video instruction on students' learning and achievement include Ortiz (2000), Acker and Klein (2001), Weeks (2002), Gale and Brown (2004) and Osisioma (2005). The study by Osisioma (2005) indicates that students learn meaningfully when they are actively involved; and read and learn with rapt attention using video instruction. The findings of an earlier study by Shyu (1999) indicated that students taught using video instruction out-performed those taught using the traditional lecture method. Xin and Reith (2001) in their study with a learning disability group observed that students exposed to video instruction demonstrated significantly greater performance gains in a word retention test than those not exposed to video instruction.

Although, educators and researchers from the fore-going discussion recognize the potentials of video instruction in improving performance in school subjects, findings from their studies are inconclusive. For instance, the outcome of the study by Kittley-Koshenina (2009) showed no significant gain by the video group over the non-video group. Howard (2001) argued that the potential of video instruction in enhancing learning is yet to be fully realized. Apart from that, studies carried out in Nigeria on the use of video instruction as a literacy package is not common (Duru, 2010; Ijiga, 2010) hence, the need for this study.

Literacy is defined by some scholars as the ability to read and write (Schrenfeld, 2001; Oyinloye, 2009). Oyinloye as cited by Popoola (2011) further refers to literacy as;

> A tool that can measure a student's ability in all areas irrespective of their gender bias in Mathematics and Science lessons. Literacy is a way of processing information which affects ways of interaction and reasoning, and a veritable tool, skill for accessing information, creating knowledge, promoting inquiry and active participation in classroom lessons.

From the fore-going definitions, literacy goes beyond the ability to read and write. The definitions further imply that it covers all categories of students, irrespective of their characteristics such as gender, special abilities and disabilities.

A literacy package in basic science by definition is an instructional package formatted for meaningful learning of science concepts and principles. Offorma (2007) views literacy packages as good resources for implementing programmes at different levels of learning.

This study therefore, investigated the influence of video instruction as a literacy package on students' performance in basic science in inclusive

classrooms. The term inclusive classroom simply refers to a learning environment that allows all students to undergo instruction irrespective of their abilities and disabilities. The National Policy on Education (2009) and the Millennium Development Goals prescribe that all children should have equal access to basic education. Moreover, basic science is a compulsory course at the basic level of education in Nigeria. The fore-going considerations underscored the need to carry out this study in an inclusive classroom. Moreover, there is a general belief by people that special needs students or students with disability do not have the cognitive ability to study science.

Purpose of the Study

The purpose of the study was to investigate the effect of video instruction as a literacy package for teaching science in inclusive classrooms. Specifically, the study determined the:

i. nature of performance of JSS1 students in Basic Science Concept Performance Test (BSCPT),
ii. nature of performance of JSS1 male and female students in Basic Science Concept performance Test,
iii. nature of performance of JSS1 regular students and slow learners in Basic Science Concept Performance Test,
iv. effect of video instruction on performance of students in Basic Concept Performance Test,
v. effect of video instruction on performance of boys and girls in Basic Science Concept Performance Test,
vi. effect of video instruction on the performance of regular students and slow learners in Basic science Concept Performance Test.

Research Questions

The following research questions guided the study:

1. What is the nature of performance of JSS1 students exposed to video instruction in BSCPT?
2. What is the nature of performance of JSS1 male and female students exposed to video instruction in BSCPT?
3. What is the nature of performance of JSS1 'regular' students and 'slow' learners exposed to video instruction in BSCPT?

Hypotheses

The following null hypotheses were formulated and tested for significance at $\alpha = 0.05$ level.

1. There is no significant difference in mean scores in the post-test BSCPT of students exposed to video instruction and those not exposed to video instruction.
2. There is no significant difference in mean scores in the post-test BSCPT of male and female students exposed to video instruction.
3. There is no significant difference in mean scores in the post-test BSCPT of regular students and slow learners exposed to video instruction.

Method and Procedure

Research Design

The study used pretest-posttest non-equivalent control group, quasi-experimental design with intact classes.

Population of the Study

The population of the study comprised 1072 Junior Secondary 1 (JSS1) students from 21 public schools in Jos North Local Government Area of Plateau State, Nigeria.

Sample of the Study

A sample of 100 students was drawn from two intact classes; each having 50 students. The sample consisted of 97 regular students, 3 slow learners; and by gender 54 girls and 46 boys.

Sampling Technique

One inclusive public Junior Secondary School out of 21 Junior Secondary Schools in the area of the study was selected using purposive sampling.

Instrument for Data Collection

The instrument used for gathering data for the study was the Basic Science Concept Performance Test (BSCPT). The instrument comprised 50 items on the concepts of Solar System and "Man in Space".

Validation of the Instrument

Two practicing and experienced teachers in science education in the Department of Science and Technology Education, University of Jos scrutinized the BSCPT items. This was to determine their face and content validity. Using Cronbach Alpha method the reliability of the BSCPT was determined as 0.72.

Procedure for Data Collection

Student participants in the study were observed and pre-tested on BSCPT by the researcher and the Basic Science teacher in the school who served as a research assistant. The administration of the instrument lasted for one hour.

The researcher taught both the experimental and control groups to guard against instrumentation bias. The two groups covered the concepts of *Solar System* and *Man in Space* for six weeks. The experimental group was taught using video instruction in addition to lecture and hands-on methods: while the control group was taught using the lecture and hands-on methods only. Each teaching session lasted for one hour and a total of two lessons were taught to each of the groups per week, thereby bringing the total number of lessons covered by each group for the six weeks to twelve. During the intervention with video instruction, students in the experimental group, watched and listened to videos on *Solar System* and *Man in Space*, and took notes. The session was also interactive in nature with a question and answer session.

At the end of the exercise, the researcher and the research assistant administered a post-test lasting one hour to both the experimental group and the control group under strict examination conditions. The post-test contained the same items as the pre-test. Both the pre-test and post-test items were scored by the researcher, and the marks presented percentage scores were set aside for data analysis.

Method of Data Analysis

The data obtained from the administration of pre-test and post- test of BSCPT items were analyzed using descriptive statistics and the t- test. The research questions were answered using frequencies and percentages while each the hypotheses was tested with t-test at $\alpha = 0.05$ level of significance.

Results

Data generated from the study were analyzed *vis-à-vis* the research questions and hypotheses as follows:

Research Question One

What is the nature of performance of JSS1 students in Basic Science Concept Performance (BSCPT) Test?

Table 1
Performance of JSS 1 Students in BSCPT

Group	Performance		
	0 – 39%	40% – 54%	55% – 64%
Experimental	02	35	13
Control	27	21	02
Total	29	56	15

The data in table 1 show that 2 students in the experimental group scored between 0% and 39%, majority of the students (35) scored between 40% and 54% in BSCPT and 13 students scored between 55% and 64% while in the control group majority of the students (27) scored between 0% and 39%, 21 scored between 40% and 54%. Only two students scored between 55% and 64%.

Research Question Two

What is the nature of performance of JSS1 boys and girls exposed to video instruction in BSCPT?

Table 2

Performance of JSS 1 Students in BSCPT by Gender

Gender	Performance		
	0 – 39%	40% – 54%	55% – 64%
Boys	00	18	08
Girls	03	08	01

The data in table 2 show that 18 boys scored between 40% and 54%, while 8 boys scored between 55% and 64%. For the girls, 3 scored between 0% and 39%, 8 scored between 40% and 54% while only 1 girl scored between 55% and 64%.

Research Question Three

What is the nature of performance of regular students and slow learners exposed to video instruction in BSCPT?

Table 3

Performance of JSS 1 Regular and Slow Learners Exposed to Video Instruction in BSCPT

Group	Performance		
	0 – 39%	40% – 54%	55% – 64%
Regular Students	53	32	12
Slow Learners	00	02	01

The data in Table 3 show that 53 regular students scored between 0% and 39%, 32 students scored between 40% and 54% while 12 students scored between 55% to 64%. For the slow learners, 2 students scored between 40% and 54% while 1 scored between 55% and 64%.

Hypothesis One

There is no significant difference in mean scores in the post-test BSCPT of JSS1 students exposed to video instruction and those of JSS1students exposed to the conventional method.

Table 4

Result of t-test of Students Exposed to Video Instruction and those not Exposed to Video Instruction

Group	Number of Students (N)	$\bar{x}$	SD	Df	t-cal	t-crit
Experimental	50	47.88	9.55			
Control	50	36.80	9.96	98	5.67	1.96

The data in Table 4 show that the calculated value of t (5.67) is greater that the critical value of t (1.96) at 0.05 level of significance. The null hypothesis is rejected. There is a significant difference in mean scores of the post-test BSCPT of JSS1 students exposed to video instruction and those of students not exposed to video instruction.

Hypothesis Two

There is no significant difference in mean scores in the post-test BSCPT of the male and female students exposed to video instruction.

Table 5
Result of t-test of Male and Female Students Exposed to Video Instruction

Group	Number of Students (N)	$\bar{x}$	SD	Df	t-cal	t-crit
Male	26	45.30	10.42			
				48	1.90	1.96
Female	24	50.46	8.68			

The data in Table 5 show that the calculated value of t (1.90) is less that the critical value of t (1.96) at 0.05 level of significance. The null hypothesis is retained. There was no statistically significant difference in mean scores of BSCPT for male and female students exposed to video instruction.

Hypothesis Three

There is no significant difference in mean scores for the BSCPT of JSS1 regular students and those of JSS1slow learners exposed to video instruction.

Table 6
Result of t-test of Regular Students and Slow Learners Exposed to Video Instruction

Group	Number of Students (N)	$\bar{x}$	SD	Df	t-cal	t-crit
Regular Students	22	50.78	9.5			
				98	1.90	1.96
Slow Learners	03	50.33	8.45			

The data in Table 6 show that the calculated value of t (1.90) is less than the critical value of t (1.96). The null hypothesis is retained meaning that there was no significant difference in the mean scores of the post-test performance of regular students and those of slow learners exposed to video instruction.

Discussion of Findings

The results of this study show that students taught using video instruction as a literacy package performed significantly better than those taught using conventional instruction - lecture. The significant influence of video instruction as a literacy package on performance of students in BSCPT is in line with the report by Osisioma (2005) that students learn meaningfully when they read, listen and are taught using video instruction. Findings from the study are equally in tandem with that of an earlier study by Shyu (1999) which indicated that students taught with video instruction out-performed those taught with the traditional lecture method. The findings further corroborates that of Reith (2001) with the learning disability group where students exposed to video instruction made significantly greater performance gains in word recognition test than the group not exposed to video instruction. The findings are however contrary to the view of Curtis and Howard (2008) who contend that the potential of video instruction in enhancing achievement of students in school subjects is yet to be fully realized. Findings from the study are equally at variance with the outcome of the study by Kittley-Koshenina (2009) which showed no significant gain by the video group over the non-video group.

Results from hypothesis two agree with the findings of Eboli and Moboghare (2004) who observed no significant gender difference in the performance of students in Health Education: but rather, both male and female students performed almost at the same level. This result refutes the commonly held belief that male students have more cognitive ability to study science than girls do. Science teachers should therefore employ the findings from this study in science classrooms. They should use innovative and active learning strategies, such as video instructional strategy in science, particularly, for those science concepts

that are abstract in nature and do not lend themselves to the use of the laboratory approach.

The findings of this study corroborates those of Xin and Reith (2009), which showed that students with learning disability had good performance outcomes in word recognition test and is at variance with the belief by some people that learners with disability cannot study science. What they need is an enabling environment.

Conclusion

From the findings of the study, it can be concluded that the use of video instruction as a literary package positively influences students' performance in basic science and other sciences subjects and science - related courses.

Recommendations

Based on the findings of the study, the following recommendations are made:

- Science teachers should use video instruction to teach abstract science concepts in science classrooms both in regular and inclusive settings.
- Efforts should be made by government to ensure that video tape equipment and software in form of literacy packages or materials are made available to basic and secondary schools in the country.
- Seminars and workshops should be organized for science teachers on video instruction and other innovative strategies by the Federal Ministry of Education and professional bodies such as, the Science Teachers' Association of Nigeria.

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