EFFECT OF VIDEO-BASED ANCHORED INSTRUCTION ON STUDENTS' ACHIEVEMENT AND RETENTION IN MOTOR VEHICLE MECHANICS WORK IN ABUJA AND NIGER STATES, NIGERIA

By

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Abstract

The study investigated the effects of video-based anchored instruction on students' achievement and retention in Motor Vehicle Mechanics (MVM) work in Abuja and Niger State, Nigeria. Two research questions were raised and two hypotheses were formulated and tested at .05 level of significance. Pre-test Post-test non-equivalent control group design of quasi experimental study was used for the study. The population for the study consisted of 428 National Technical College (NTC) II MVM work students. The sample size for this study consisted of 180 students, with 68 students in the experimental group and 112 students in the control group. The instrument used for data collection was Motor Vehicle Mechanics Work Achievement and Retention Test (MVMWART). The reliability coefficient of MVMWART was found to be 0.76 using Pearson Product Moment Correlation coefficient. Mean was used to answer the research questions; while ANCOVA was employed to test the hypotheses. Findings of the study revealed that video-based anchored instruction is more effective in improving student's achievement and retention in MVM work than conventional teaching method. It was therefore recommended that teachers, especially those teaching MVM work should adopt video-based anchored instruction to teach students at technical colleges to enhance students' cognitive achievements and retention in MVM work.

Keywords: Video-Based Anchored Instruction, Achievement, Retention & Motor Vehicle Mechanics Work

INTRODUCTION

Motor Vehicle Mechanics (MVM) work is one of the trade programmes obtainable in technical colleges in Nigeria. According to the National Board for Technical Education (NBTE, 2001), the goal of MVM work programme is to produce skilled craftsmen with quality knowledge of the working principles of motor vehicles, the techniques and safety practices involve in the maintenance and repairs of vehicles. There have been continual reports of high rate of failure amongst graduates of the technical colleges (FGN, 2011). According to Chinda (2006), among the several factors standing against the successful attainment of the objectives of technical education is the instructional strategies adopted by technical teachers in the technical colleges. Moreover, Paden and

Dereshiwsky (2007) and Omenka (2010) attributed the low achievement and retention rate in science and technical students to conventional teaching method mainly adopted by teachers.

The conventional methods of teaching which are teachers centred that is persistently used for years is now gaining poorer results when compared with the modern and revolutionary teaching methods (Jackson, 2012). The negative attributes associated to the conventional teaching methods pose a challenge in the teaching and learning process at technical colleges. Furthermore, Idris (2012) also articulated that this challenge necessitates a shift from conventional teaching methods to constructivist (anchored) instructional approaches.

Anchored instruction is an attempt to help students become more actively engaged in learning by situating or anchoring instruction around a realistic technology based presentation. Anchored instruction anchors or situates instruction that provide the students with relevant details to help solve problems (Barab, 2000). According to Love (2004); Cena and Mitchell (1998), the primary goal of anchored instruction is to solve the inert knowledge problem by permitting students and teachers to comprehend not only the problems and opportunities that experts encounter in different areas but also how experts use knowledge as a tool. Video based anchored instruction provides background knowledge about the problem and creates a shared learning experience for the students. Bottge (2009) revealed that video based anchored instruction are typically shown in a short video usually 8 to12 minutes, which students explore interactively and construct knowledge from the instruction. Video programme results in superior memory because information is dual-coded as both verbal and non-verbal representation. However, Peter (2014) opined that all these elements of video programme are necessary tools that will assist the teacher in teaching the skill requirements of MVM work students which will consequently improve student's academic achievements and retention.

Academic achievement therefore, implies performance in school subject as represented by a score on an achievement test. Lavin theory in Oyetunde (2010) refers academic achievement to some methods of expressing a student's scholastic performance. This can be regarded as course or subject grade, an average for a group of subjects in a programme of study (in this case, MVM work is being referred to). According to Mbah (2002), achievement is dependent upon several factors amongst which are instructional techniques, the learning environment, motivation as well as retention. Hence, the academic achievement of students in MVM work also depends on the retention capability of the students in the subject. Agaba (2013) also confirmed that achievement in education is directly connected to knowledge retention.

However, retention could be described as the ability to replicate the learnt concept when the need arises. Hornby (2000) defines retention as the ability to remember experiences and things learnt. For knowledge to be retained for a long time by the students the teachers must use effective instructional techniques in the classroom. However, Osemmwinyen (2009) and Gatlin (2008) found that student's achievements and retention could be aroused and retained through the use of an appropriate instructional media akin to video based anchored instruction.

It is quite unfortunate that despite the efforts by the government to ensure qualitative education at the technical college level, there have been constant reports of high failure rate amongst graduates of technical colleges (FGN, 2011; NABTEB, 2006). The poor performance in MVM work was traced to the NABTEB Chief Examiner's report (2010 to 2014) in Abutu, Raymond, Dopemu, Jido & Atsumbe (2015). The poor performances of students in technical colleges might be due to the use of un-motivating and un-challenging methods and approach by their teachers. Oranu (2003) observed that in most technical colleges, the teaching methods used in

teaching are mainly the conventional teaching methods which include lecture and discussion methods. The shortcoming in these conventional methods of teaching could be accountable for poor achievement of MVM work students in public examinations (NABTEB 2012). The problem of this study is; what will be the effects of video based anchored instruction on student's achievement and retention in MVM work at technical college level?

Objectives of the Study

The aim of the study was to investigate the effects of video-based anchored instruction on student's achievement and retention in MVM work in Abuja and Niger State, Nigeria. Specifically, the objectives of the study were to determine the:

1. Effect of video-based anchored instruction on students' achievement in MVM work.
2. Effect of video-based anchored instruction on students' retention in MVM work.

Research Questions

The following research questions guided the study

1. What is the effect of video based anchored instruction on students' academic achievement in MVM work?
2. What is the effect of video based anchored instruction on students' retention in MVM work?

Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance:

H_{01}:   There is no significant difference in the mean achievement scores of students taught MVM work using video based anchored instruction and those taught with conventional teaching method.

H_{02}:   There is no significant difference in the mean retention scores of students taught MVM work using video based anchored instruction and those taught with the conventional teaching method.

METHODOLOGY

Pretest–posttest non-equivalent control group design of quasi-experimental study was adopted for the study. According to Nworgu, (2006), random assignment of subjects in such a design is not required. The design was slightly modified for this study by adding a delayed post-test (retention test). The design is symbolically represented as follows:

Experimental O_1 X O_2 Y O_3
Control O_1 - O_2 Y O_3

Where:

O_1: observation or measurement before the treatment

O_2: observation or measurement after treatment

O_3: Test to be conducted two weeks after the post-test

X: Experimental treatment (Video-based Anchored Instruction);

Y: Delayed period of two weeks after post-test.

The study was conducted in Federal Capital Territory (FCT), Abuja and Niger State. FCT, Abuja and Niger state are located in the North Central geopolitical zone of Nigeria. The population for this study comprised of 428 National Technical Certificate (NTC) II MVM work students of 2015/2016 session in FCT Abuja and Niger State, Nigeria. A sample size of 180 NTC II MVM work students was selected for the study. Simple Random Sampling (SRS) technique was used in selecting GTC Minna and Mamman Kontagora Technical College (MKTC), Pandogari from the list of the six technical colleges in Niger State. The only two technical colleges in FCT, Abuja which are Federal Science and Technical College (FSTC), Orozo, Government Science Technical College (GSTC), Garki were selected. Hence, no sampling was required in the selection of the two technical colleges in FCT, Abuja. One technical college each were assigned to the control group and the remaining one each were assigned to the experimental group. Motor Vehicle Mechanics Work Achievements and Retention Test (MVMWART) is the instrument used for data collection. The MVMWART consisted of 50 multiple choice items with four response options was used for testing student's achievement and retention in MVM work. The

MVMWART was developed by the researcher based on Curriculum for Motor Vehicle (CMV) 14 (Transmission System) modules in the NTC II MVM work curriculum.

The researchers prepared two sets of lesson plans for the teaching of the module selected for the study. Each set contains eight lesson plans that lasted for a period of eight weeks for the minimum of two hours duration. One set of the lesson plan was written based on video-based anchored instruction used by the teacher for the experimental group, while the second set was prepared based on conventional teaching method and was used by the teacher for the control group.

Eight set of anchor videos in MP4 format were used for the study. The videos were adopted from YouTube and modified to suit the need for the study. The modifications made on the videos included splitting, merging and adding textual information to introduce the instructions. Video show android application, version 4.5 and Balbolka applications were used for the modifications.

The instruments were subjected to face and content validation by three experts that include one lecturer from the Department of Industrial and Technology Education, Federal University of Technology, Minna, Nigeria one staff from the Examination Development Department (Auto Unit) of National Examination Council (NECO) and one subject teacher from the Auto-Mechanics Department of Vocational Enterprise Institute, Karshi, Abuja. To ensure the reliability of the MVMWART, a trial test was conducted using NTC III MVM work students in Government Technical College, Mada Station, Nasarawa state, Nigeria (different from the area of the study). The split-half reliability technique was used. The reliability coefficient value of MVMWART was determined as 0.77 using Pearson Product Moment Correlation (PPMC). Nevertheless, item analysis was carried out on the 60 items developed in the MVMWART to determine the Difficulty and Discrimination Indices of each item in the test. Items having negative discrimination are rejected and items having discrimination index above 0.20 are ordinarily regarded as satisfactory for use in most tests of academic achievement (Boopathiraj & Chellamani, 2013).

The study involved three main stages, which include the administration of pre-test, post-test and retention test that contained the same questions but rearranged after each administration. The study was conducted for a period of 11 weeks during which eight topics in MVM work were covered. The pre-test was administered in the first week of the research exercise to the whole students before the experimental and control groups are subjected to the treatments. After the administration of the pre-test, students in the experimental group were taught using the video-based anchored instruction and students in the control group were taught using the conventional teaching method. Both groups were taught by their regular teachers. The teaching process lasted for eight weeks after which a post-test was administered to all the students to determine their mean achievement in MVM work. Three weeks after the post test, a retention test was administered to all the students to determine their retention mean scores in MVM work. Extraneous variables such as Hawthorne effect was controlled by the use of regular subject teachers, influence of subject interaction was controlled by the use of intact classes, pre-test and posttest sensitization were control by re-arrangement of items in the MVMWAT after the administration of the pre-test and posttest.

The data collected for this study were analyzed using the Statistical Package for Social Sciences (SPSS) version 20.0. Descriptive and inferential statistics were used to analyze the data. General Linear Model (univariate) function was used to perform the Analysis of Covariance (ANCOVA). Group with higher mean value irrespective of the closeness in the mean value of the other were taken to have performed better in achievement or retention test or showing much interest in MVM work. If the significant of F is less than 0.05, the null hypothesis should be

rejected and if the significance of F is greater than

0.05, the null hypothesis should be accepted.

RESULTS

Research Question 1: What is the effect of video-based anchored instruction on student's achievement in MVM work?

Table 1: Mean of Pre-test and Post-test Scores of Students Taught MVM Work Using Video-Based Anchored Instruction and Those Taught with Conventional Teaching Method in the Achievement Test

Group	N	Pre-test Mean	Post-test Mean	Mean Gain
Experimental	68	10.93	42.17	31.24
Control	112	11.00	30.27	19.27

Table 1 shows that the experimental group had a mean score of 10.93 in the pre-test and a mean score of 42.17 in the post-test with a pre-test, post-test mean gain in experimental group to be 31.24. The control group had a mean score of 11.00 in the pre-test and a post-test mean of 30.27 with a pre-test, post-test mean gain of 19.27.

Research Question 2: What is the effect of video-based anchored instruction on student's retention in MVM work?

Table 2: Mean of Pre-test and Retention Test Scores of Students Taught MVM Work Using Video-Based Anchored Instruction and Those Taught with Conventional Teaching Method in the Retention Test

Group	N	Pre-test Mean	Retention-test Mean	Mean Gain
Experimental	68	10.93	35.74	24.81
Control	112	11.00	20.62	9.62

Table 2 shows that the experimental group had a mean score of 10.93 in the pre-test and retention mean score of 36.60 in the retention test with a pre-test, retention test mean gain in experimental group to be 24.81. The control group had a mean score of 11.00 in the pre-test and a retention mean score of 20.76 with a pre-test retention test mean gain of 9.62.

Hypothesis One: There is no significant difference between the mean achievement scores of students taught MVM work using video-based anchored instruction and those taught with conventional teaching method.

Table 3: Summary of Analysis of Covariance (ANCOVA) for Test of Significant Difference between the Achievements of Students Taught MVM Work Using Video-Based Anchored Instruction and Those Taught with Conventional Method

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3918.69[a]	2	1959.35	27.20	.00
Intercept	4640.42	1	4640.42	64.41	.00
Pretest	43.33	1	43.33	.60	.44
Group	3763.40	1	3763.40	52.24	.00*
Error	12751.86	177	72.04		
Total	223325.00	180			
Corrected Total	16670.55	179			

a. R Squared = .235 (Adjusted R Squared = .226)

*Significant (F less than .05)

Table 3 shows the F-calculated value for the effect of instructions on the cognitive achievement of students taught MVM work using video-based anchored instruction and those taught with conventional teaching method. The F calculated value for the groups is 52.24 with a significant of F at .00 which is less than **.05**. The results indicated that there was statistically significant difference between the achievement mean scores of students taught MVM work using video-based anchored instruction and those taught with conventional teaching method.

Hypothesis Two: There is no significant difference between the mean retention scores of students taught MVM work using video-based anchored instruction and those taught with the conventional teaching method in the MVM work retention test.

Table 4: Summary of Analysis of Covariance (ANCOVA) for Test of Significant Difference between the Retention Mean Scores of Students Taught MVM Work Using Video-Based Anchored Instruction and Those Taught with Conventional Teaching Method

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	9703.39[a]	2	4851.69	150.02	.00
Intercept	3032.68	1	3032.68	93.78	.00
Pretest	31.45	1	31.45	.98	.33
Group	9480.84	1	9480.84	293.16	.00*
Error	5724.28	177	32.34		
Total	140195.00	180			
Corrected Total	15427.66	179			

a. R Squared = .648 (Adjusted R Squared = .644)

*Significance (F less than .05)

Table 4 shows the F-calculated value for the effect of instructions on the knowledge retention of students taught MVM work using video-based anchored instruction and those taught with conventional teaching method. The F calculated value for the groups is 293.16 with a significant of F at .000 which is less than 0.05. The results indicated that there was statistically significant difference between the retention mean scores of students taught MVM work using video-based anchored instruction and those taught with conventional teaching method.

Findings of the Study

1. The students taught MVM work using video-based anchored instruction obtained higher achievement mean scores than the students taught with conventional teaching method.

2. The students taught MVM work using video-based anchored instruction obtained higher retention mean scores than the students taught with conventional teaching method.

3. There was significant difference in the achievement mean scores of students taught MVM work using video-based anchored instruction and those taught with the conventional teaching method.

4. There was significant difference in the retention mean scores of students taught MVM work using video-based anchored instruction and those taught with the conventional teaching method.

DISCUSSION OF FINDINGS

The results presented on student's achievement mean scores in MVM work revealed that

the students taught MVM work using video-based anchored instruction obtained higher achievement mean scores than the students taught with conventional teaching method in the MVM work achievement test. The finding is in-line with the findings of Beck, King & Marshall (2012) that revealed video format promotes learning by supporting student's cognitive processing and improvement of detailed mental representations in several ways which consequently improve the achievements of students. Moreover, Shyu (2000) revealed a related view concerning the finding that video-based anchored instruction helped students to understand what they learned through the improvement of problem-solving skills.

The summary of Analysis of Covariance (ANCOVA) for the test of significant difference between the achievement mean scores of students taught MVM work using video-based anchored instruction and those taught with conventional teaching method revealed a statistically significant difference between the achievement mean scores of students taught MVM work using video-based anchored instruction and those taught with conventional teaching method. The finding is in conformity with the findings of Adenkunle (2013) study on the development and validation of auto-mechanics intelligent tutor for teaching auto-mechanics concepts in technical colleges found significant difference in the achievement mean scores of students in the experimental group and the control group.

The results presented on student's retention mean scores in MVM work revealed that the students taught MVM work using video-based anchored instruction obtained higher retention mean scores than the students taught with conventional teaching method in the MVM work retention test. The finding is in harmony with the findings of Sims (2008) who carried out a study on futures for computer-based training: Developing learner-computer interface revealed that learning which resulted from the use of computer is more efficient in terms of effective transfer of knowledge as well as the facilitation of recall and the quality of retention.

Furthermore, the summary of Analysis of Covariance (ANCOVA) for the test of significant difference between the retention mean scores of students taught MVM work using video-based anchored instruction and those taught with conventional teaching method shows that there was a statistically significant difference between the retention mean score of students taught MVM work using video-based anchored instruction and those taught with conventional teaching method. The finding is similar with the findings of Adekunle (2013) study on the development and validation of auto-mechanics intelligent tutor for teaching auto-mechanics concepts in technical colleges that revealed statistical significant differences in the retention mean scores of students in the experimental group and the control group.

CONCLUSION

The results obtained revealed that cognitive achievement and cognitive retention of students were enhanced using video-based anchored instruction. Consequently, video-based anchored instruction has the potential to enhance learning via video applications by actively involving students in the learning process and minimising teacher's involvement in the teaching processes. The use of video-based anchored instruction has value as an instructional tool for MVM work. Therefore, it is concluded that video-based anchored instruction has positive effect on student's achievement and retention in Motor Vehicle Mechanics Work at Technical College level.

RECOMMENDATIONS

Based on the findings of the study on the research questions, the researcher recommends the following:

1. National Board for Technical Education as a body concern with curriculum development should carry out a review of MVM work trade curriculum for Technical Colleges with a view

to incorporate video-based anchored instruction into the teaching of MVM work.

2. Teachers especially those teaching MVM work and other technical subjects should adopt video-based anchored instruction and other video instructional strategy to teach students at technical colleges to stimulate student's interest and enhance student's cognitive achievements and retention in MVM work.

3. Teachers and students of MVM work should break away from the old method of teaching and ensure the instruction in technical colleges become student centred and active learning oriented as exemplified in the use of video-based anchored instruction.

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