

Interactive Video Instruction for Auto-Mechanics Trade: Implication on Students' Psychomotor Achievement.

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Abstract

The study investigated the effect of Interactive Video Instruction on the psychomotor achievement in auto-mechanics in technical colleges. The study was conducted in Lagos state. One research question and one hypothesis guided the study. The study adopted pretest–post-test quasi experimental design. The sample size for this study consisted of 72 participants. A multi stage sampling technique was used for selection of two schools for the study. The study compared interactive video instruction to the use of Conventional teaching method. Auto-Mechanics Skill Performance Test (AMSPT) and Psychomotor “On the Spot” Rating Scale were the main instruments used for data collection. AMSPT consisted of standardized practical test adopted from the past NABTEB question papers and requires no face validation while content validity was conducted on the two instruments by 3 experts. Inter-rater reliability strength was determined using Kendall's coefficient of Concordance which yielded 0.8533. Research question was analyzed using Means while the null hypothesis was tested at 0.05 level of significance using ANCOVA statistics. Interactive Video instructional medium was found to be more effective in helping students and are responsible for the learning of skill performance observed. Based on the findings of this study, it was recommended among others, the adoption of interactive videos instruction for enhancing students' psychomotor achievement in Nigerian technical colleges.

Key words: Interactive Video Instruction, Auto-mechanics trade, Psychomotor achievement and Technical colleges.

Background of the Study

Interactive video instruction opens new avenues for increasing the variety of possible instructional strategies that a teacher may employ to optimize learner performance, and as such may in turn elevates the potential for quality education and training in this era of computers and electronic media. This is so, because interactive video instruction also has the potential for making computer-based instruction more adaptive and interactive (White, 2007) and could be employed to help move beyond traditional, lecture-style teaching method. Interactive video instruction (IVI) integrates the computers capacity for interactivity, information management, and decision-making with the audiovisual capabilities of videodisc or videotape (Quality Assurance Project, 2000). According to Knebel, it may also combine variety of media stored on a videodisc, such as full-motion video, readily accessible for viewing. Knebel further explained that IVI has proven to be as effective as other computer approaches in education.

Video according to Yussuf (2000) is a medium of transmitting information in the form of sound and image to be displayed on the Cathode ray tube. Yussuf stressed that Video can combine still and motion pictures in its pictorial presentation and it is a medium which can be used to achieve various teaching and learning objectives. He stressed that it is relevant as an introductory material for lesson presentation, a major source of

information, a means of modelling, stimulus for discussion and of distribution and relay. Yussuf further explained that video can also be used as: a magnification medium, an information storage system and a means of assembling visual and audio information. Video according to Oguz-Unver & Yurumezoglu (2011) stimulates concentration and motivation in students throughout the teaching process and helps students conceptualize and internalize difficult and abstract topics.

Maione and Mirenda (2006) reported that the research findings are positive in terms of the advantages of video instruction which includes helping in the learning of content; it is useful to orient learners with new units for the purpose of integrating prior knowledge with new materials; and assists in recalling learning materials through audio-visual and contextual features. Oguz-Unver & Yurumezoglu (2011) further reported that streaming video enhances student attention and thus improves academic achievement; helps prepare teachers to be more effective in the classroom and may also change the nature of classroom interaction in ways that facilitate learning. More importantly, Felton, Keesee, Mattox, McCloskey and Medley (2001) explained that certain principles that cannot readily be observed in a conventional classroom setting may be demonstrated by using videotape. Remarkably, the use of interactive video instruction can be regarded as a good instructional medium and a key technology for effective process of teaching and learning of psychomotor contents of auto-mechanics trade in technical colleges.

Auto-Mechanics trade is a mechanical trade offered as Motor Vehicle Mechanics work trade in Nigeria Technical Colleges (Federal Republic of Nigeria, 2004). Motor Vehicle Mechanics work trade in Nigerian technical college education is aimed at planned to producing craftsmen and master craftsmen who should be competent and skillful to carryout routine services and repair of all types of vehicles (NBTE, 2003). The trades involve repairs and maintenance of brake, transmission, engine, fuel, cooling and lubrication system of a vehicle. An auto mechanics craftsman is expected to test, diagnose, service and completely repair any fault relating to the conventional automobile assembly main units and systems to the manufacturers' specifications (NBTE, 2003). This being the case, interactive video instruction can be an effective medium for engaging and supporting these practical activities in Nigerian technical colleges to enhance the students' psychomotor achievement and retention.

The "psychomotor domain" measures the skill performance of the learner. Performance test is used to assess the attainment of the objective in psychomotor domain (Okoro, 2002). Okoro further pointed out that practical tests or skill performance tests are best for the assessment of the psychomotor skill. This is so, because the performance required will involve manipulation of objects, tools, supplies or equipment. The criteria for achievement of psychomotor outcome will relate to the actual performance or the finished product and to the necessary level of performance. In view of the above, students' psychomotor achievement is the translation of the student's performance in practical test into scores or marks.

Meanwhile, Auto-Mechanics trade in modern day requires the use of expensive and sophisticated equipment. Auto-mechanics trades in Nigerian technical colleges prepare students for industry by exposing them to the types of tools and equipment they will

need to use in their respective workplaces. This may involve manipulation of materials or objects in form of performance task as simple as using a spanner to tightening or unscrew a bolt or as complex as using a set of tools in a process of dismantling and assembling an engine as applicable in a Motor Vehicle Mechanics work training. Since it is presumed that the purpose of Interactive Video Instruction is to assist learning (Benney, 2001), it can be an effective tool for engaging and supporting these activities as an instructional medium.

Interactive video instruction can promote constructivist learning, learning that occurs when learners seek to make sense of presented material by constructing a coherent mental representation (Mayer, 1999). Mayer further supported the dual-code hypothesis, which predicts the students learn better when provided with visual and verbal knowledge representations rather than visual or verbal representations alone. That is, learning with non-redundant, integrated words and pictures is significantly more efficient than learning with text or pictures alone. With interactive video instruction, learners function as problem solvers in using computer as tool for accessing and interpreting the content of the subject matter and thus organizing their personal knowledge (Zahide, 2006). As a result of this interaction, interactive video instruction is expected to promote critical thinking, higher order learning and solve complex problems or communicate through media which many experts believed to be the skills needed to function effectively in the twenty-first century.

However, little is known about how such intervention impacts student outcomes in the psychomotor achievement in a subject like auto-mechanics in technical colleges. This could be evident in the methods of teaching employed by the vocational and technical teachers in technical colleges as the conventional method of "talk and chalk" still remained the prevalent medium of instruction. In connection with this, the study investigates whether an interactive video instruction designed to teach auto-mechanics in technical colleges improve students' psychomotor achievement in auto-mechanics in technical colleges.

Statement of the Problem

Increased attention on the use of computer-based technologies (especially, Interactive Video Instruction) in the classroom in recent years and the present skills demand for long-life learning and self-reliance in the workplaces have presents challenges for redirecting instructional delivery in Technical colleges. This is because today's society is becoming more and more dependent on digitalized devices and as such become inevitable for students who will live and work in the digital world. Moreover, there is a general concern over the apparent low performance of technical college graduates, especially those of auto-mechanic trades. Majority of students have been completing the programme with very poor academic performance and inadequate skills which might not be possible to earn them a living (Owosho, 2009). This decline in students' performance has been attributed to a number of factors, among which is the instructional method adopted by the teacher. The situation was further implicated by the 2006 NABTEB Chief Examiners' report that attributed the poor performance of students in National Technical Certificate (NTC) examinations in recent times as partly due to the teaching methods adopted by the teacher. Hence, there is the need to make frantic efforts at improving the

pedagogic styles by providing opportunities for students to engage in higher order learning and instruction that combines sound learning principles with the functionality of computers which constitutes a potentially effective teaching method (Kante & Savani, 2003). It therefore becomes imperative to further explore the potential of interactive video instructional medium in order to extend and optimize its benefit to students in the learning of auto mechanics in technical colleges. The study therefore investigate the effect of interactive video instruction on the students' psychomotor achievement in auto-mechanics in technical colleges.

Purpose of the Study

The main purpose of the study was to determine the effect of interactive video instruction on students' psychomotor achievement in auto-mechanics trades' students in technical colleges in Lagos state.

Significant of Study

The findings will be of benefit to the following groups: National Board for Technical Education (NBTE), curriculum developers, educational technology experts, teachers, students, automotive industries and the society at large. The findings will be considered significant because it had indicated that Interactive Video Instruction which had been developed and validated could be highly beneficial in facilitating and improving psychomotor achievement or training in Auto-mechanics.

The findings of the study would provide the needed information and empirical evidence to technical and vocational education stakeholders such as NBTE as a body that is responsible for planning the curriculum adopted in technical colleges, the policy makers, education ministries and educational administrators on adequacy of Interactive Video Instruction in teaching and learning Auto mechanics in technical colleges. With the adoption of Interactive Video Instruction, curriculum planners would gain more insight on the use of computer-based instructional process of teaching and learning. When more knowledge is acquired about computer-based instructional learning process, the knowledge will directly influence the design of technical college curriculum in line with the workplace skills. Therefore, the findings of the study would provide curriculum planners with information needed to enrich future trend of auto-mechanics curriculum.

The students would also benefit from the findings of this study in that it could provide adequate technique of studying Auto-mechanics to a mastery level by transforming the auto mechanics contents of the Nigerian technical college curriculum into a computer-based package which could be used for learning by the students at that level. The use of video scripts to teach physical tasks that students can perform by taking on the role of an actor in a virtual process will improve the students' psychomotor achievement thereby equipping them with required workplace knowledge and skills. This in effect would result in the training of competent craftsmen that would be adaptable to the future and present challenges in automobile industries occasioned by technological advancement. Invariably, employability, earning capacity and job mobility of students would be improved.

The pedagogical skills of teachers in technical college will improve on the use instructional learning techniques if the findings of this study are well implemented. The

study would offer the teachers the opportunities to keep abreast of the recent trend of technological applications and teaching techniques in his subject. The student interaction with auto-mechanics Interactive Video Instruction in technical college school environment will afford the teacher a great opportunity to the information on the use of Interactive Video Instruction as a learning medium that would transform the present isolated, teacher-centred and text bound classroom into a rich student-centred and interactive knowledge-based environment that would enhance students' cognitive achievement

Automotive industries would also benefit from the findings of this study by providing them with a veritable medium of instruction for training motor vehicle mechanics practitioners who will be able carry out repair work and maintenance of modern vehicles competently. Invariably, the security of life is partly guaranteed when the people in the society are transported in a vehicle with secured mechanical components. Automotive industries would also benefit from the findings of this study by providing them with a veritable medium of instruction for training motor vehicle mechanics practitioners who will be able carry out repair work and maintenance of modern vehicles competently. Invariably, the security of life is partly guaranteed when the people in the society are transported in a vehicle with secured mechanical components.

Scope of the Study

The study determining the effect of interactive video instruction on students' psychomotor achievement in auto-mechanics trades in technical colleges. It was delimited to NTC II Motor Vehicle Mechanics Work students in Lagos state. The study made use of a software package suite known as Auto-Mechanics Intelligent Tutor (AMIT) play the video clips (with the repair works and activities by the motor vehicle mechanics or technician presented using video clips format) and conventional teaching approach. AMIT software was developed and validated for teaching Auto-Mechanic concepts in technical colleges (Abd-El-Aziz, 2013). The contents for the study consist of the removal of an engine from the Vehicle and general dismantling procedures; examination and renovation of engine components or parts; and re-assembling of engine components or parts which were selected from the Auto-mechanics trade programmes modules for NTC II.

Research Questions

The following research questions were formulated to guide the study:

1. What is the effect of interactive video instruction on students' psychomotor achievement in auto-mechanics trades in technical college?

Hypotheses

The following hypotheses test guided the study at 0.05 level of significance:

H₀₁: There is no significant difference between the mean scores of experimental and Control groups in the psychomotor achievement of students in Auto-mechanics trades in technical college.

Research Methodology **Design of the Study**

The study adopted quasi-experimental design. The design was considered the most appropriate for this study as intact classes were used. The design was represented thus:

E	O_1	X	O_2
C	O_1	--	O_2

Where, **E** = Experimental Group, **C** = Control Group, O_1 = Pretest,
X = Interactive Video Instruction, -- = Conventional Instruction,
 O_2 = Posttest,

Area of the Study

The study was conducted in two Government Science and Technical colleges in Lagos state. The two Government Science and Technical colleges are Government Science and Technical colleges, Adosoba and Government Science and Technical colleges, Ikotun.

Population of the Study

The population of the study comprised of all 231 NTC II Motor Vehicle Mechanic Work students in Lagos state. The students' population consisted of 2011/2012 session obtained from Lagos state board of technical education. The choice of NTC II Motor Vehicle Mechanic Work students was to ensure that students used for the study are already familiar with the course.

Sample and Sampling Techniques

The sample for this study consisted of 72 NTC II students from two technical colleges in Lagos state. A multi-stage sampling technique was used. At the first stage, two schools were drawn from six schools through random sampling. Thereafter, one school was assigned to the experimental and the other to the control group through balloting. Intact classes in each school were used.

Instrument for Data Collection

The instrument used in the collection of data for this study consisted of Auto-Mechanics Skill Performance Test (AMSPT) and Auto Mechanics Psychomotor "On the spot" Rating Scale. Auto-Mechanics Skill Performance Test (AMSPT) was adopted from the past NABTEB practical question papers and designed for measuring students' Psychomotor Achievement in Auto – Mechanics. On the other hand, Auto Mechanics Psychomotor "On the spot" Rating Scale is used by the auto mechanic teachers for the assessment of the subjects. The instrument consists of sixty items grouped into 12 unit areas with 5 items under each group. Each of the items were rated on a 5- point rating scale (Great extent = 5; To an extent = 4; Somewhat extent= 3; A little extent = 2; and Not at all = 1).

Validation of Instrument

The items in the Auto-Mechanics Psychomotor Achievement Test (AMPAT) consisted of standardized questions adopted from the past NABTEB practical question papers. For that reason, AMPAT requires no face validation. Meanwhile, face validity was conducted on Auto Mechanics Psychomotor "On the spot" Rating Scale by two experts and three teachers in the field of auto mechanics. Content validity of the items was established by given the Auto-Mechanics Psychomotor Achievement test; Auto Mechanics Psychomotor "On the spot" Rating Scale; and their respective table of specifications to three experts and two Auto-Mechanics teachers from the Colleges of Education. Modifications were made based on the comments of the Validates

Reliability of the Instrument

AMSPT was trial tested on a sample of NTC III students in a government technical college similar to those to be used for the treatment in Oyo state. Five raters who are graduate Auto–Mechanics teachers were made to assess ten students in a practical class attending to AMSPT, Auto Mechanics Psychomotor "On the spot" Rating Scale was the basic instrument of assessment used during the process. The data obtained were used for assessing agreement among raters. The degree of Raters or Judges Concordance was assessed using Kendall's coefficient of concordance. The concordance strength was found to be high ($\bar{w} = 0.8533$). The reliability was therefore considered to be good enough for the acceptance of the instrument as being reliable.

Experimental Procedure

For the purpose of this study, the researcher developed two lesson plans. The first lesson plan consisted of interactive video instruction, while the other lesson plan composed of conventional lesson plan. The pretest was administered on both experimental and control groups to draw a baseline for data generated prior to the commencement of the experiment. The researcher taught the control group using the traditional instruction method while two auto-mechanic teachers with the assistance of technician in the computer laboratory facilitated the students' interaction with the computer (that is, interactive video instruction) in the experimental group. Each student registered for the course with a registration number and a password which are to be used throughout the time of using AMIT in the experimental group.

Teacher organized the classroom in such a manner that each computer has a functional speaker (either external or preferably, internal) and a printer in the network for each subject. In order to facilitate hand-on-experience activities during practical sessions, three four-cylinder in-line engines along with necessary tools and materials were arranged on stage for the students to facilitate practices by the students. The workstations in the school amounted to 17. As such, three periods of 40 minutes were allocated for each student officially. More so, the students in experimental group visited the computer laboratory with no restriction anytime apart from three period lesson fixed for the lesson to work on the intelligent tutor per week. Each lesson was accompanied by a quiz. The user cannot proceed to the next lesson until and unless he passes the quiz and so, each student carried out the quiz on the intelligent tutor, scored by the tutor and displayed the results instantly. The treatment lasted for a period of eight weeks.

At the end of the treatments, post-test was administered on the two groups. Subjects in the experimental group had their examination on the computer. The scoring of the test, storing into the database and displaying of results were done instantly by the tutor. The students in the control group wrote their test on paper. The scripts were collected, marked and scores recorded manually. The same instrument that is, AMPAT that was initially used for pretest was reshuffled or re-arranged in order to make the test look different and was administered on the subjects for post-test. The same time were allowed for the pretest and posttest. The posttest was administered just immediately the last topic was taught in each group in order to prevent maturation effect.

Method of Data Analysis

Mean scores were used to answer the research questions. A group that had a posttest score higher than the other was deemed to have performed better than the other. Hypotheses were analyzed at .05 level of significance using Analysis of Covariance (ANCOVA) statistics. Null hypotheses were rejected when the value of sig. of F is less than 0.05 ($p > .05$), otherwise ($p < .05$), the null hypotheses was upheld.

Research Question: What is the effect of interactive video instruction on students' Psychomotor achievement in auto-mechanics trades in technical college?

Table 1: Pretest and Post test Mean scores and Standard deviations of the Experimental And Control in Psychomotor Achievement of Students

Psychomotor Achievement						
Group	N	Pretest		Post -test		Mean Gain
		Mean	SD	Mean	SD	
Experimental	33	7.5758	4.7324	34.8788	11.6374	27.3030
Control	39	7.0000	4.9254	26.2308	7.9 288	19.2308

Table 1 revealed that the experimental group obtained a pretest mean score of 7.5758 and a post test mean score of 34.8788 while the control group obtained a pretest mean score of 7.0000 and a post test mean score of 26.2308. More so, the results from the table unraveled that post test-post test mean gain of 8.0722 was recorded in favour of experimental group. The result implies that students in experimental group performed better than those in control group.

Hypothesis:

HO₁: There is no significant difference between the mean scores of Experimental group and Control group in the psychomotor achievement of students in Auto-mechanics trades in technical college.

Table 2: Summary of Analysis of Covariance (ANCOVA) of Students' Psychomotor Achievement Scores in Auto- Mechanics based on Modes of Instruction

Source	Type III Sum of Square	Df	Mean Square	F	Sig of F
Correct Model	4245.735 ^a	2	2122.867	38.410	0.000
Intercept	6106.060	1	6106.060	110.479	0.000
Pretest	2908.895	1	2908.895	52.632	0.000
Group	1065.284	1	1065.284	19.275*	0.000
Error	3813.543	69	55.269		
Total	73702.000	72			
Corrected Total	8059.278	71			

*Significance at Sig of F < 0.05

The data presented in Table 3 indicates that F value of 19.275 for the group was indicated to be significant at 0.000 level (which is less than 0.05 level). This implies that null hypothesis of no significant difference between the mean scores of experimental group and control group in the psychomotor achievement of students in Auto-mechanics

trade programmes in technical college is rejected. Hence, there is significant difference between the mean scores of Experimental group and control group in the psychomotor achievement of students in Auto-mechanics trade programmes in technical college.

Summary of Findings

The summary of findings of the study includes:

1. The students in the experimental group obtained higher mean score than those in the control group in the psychomotor achievement test.
2. There is significant difference between the mean scores of experimental group and control group in the psychomotor achievement of students in Auto-mechanics trade programmes in technical college.

Discussion of the Results

The results presented in Table 1 and 2 establishes the fact that mode of lesson presentations was a significant factor for enhancing students psychomotor achievement. Table 1 unveiled that the mean achievement scores of students taught with interactive video instructional medium (34.8788) was higher than those of students taught with conventional teaching method (26.2308). This means that interactive video instructional medium produced a tremendous positive impact on students' Psychomotor performance than the Conventional teaching method. The result was further corroborated in Table 2 where F value of 1065.284 is significant at 0.000, which is less than 0.05. There is therefore, a significant difference ($p < 0.05$) between the mean scores of experimental group and control group in the psychomotor achievement of students in Auto-mechanics trade programmes in technical college. As such, students who were taught using Interactive Video instruction performed significantly better than those who were taught using the conventional teaching method. These findings were supported by earlier findings by Oguz-Unver and Yurumezoglu (2011) who researched on the effective presentation of inquiry-based classroom experiments using teaching strategies that employ video and demonstration methods; Yussuf (n.d.) who investigated the effect of videotape and slide-tape instructions on students' performance in junior secondary school social studies; and Felton, Keesee, Mattox, McCloskey and Medley (2001) whose study was on Comparison of Video Instruction and Conventional Learning Methods on Students' Understanding of Tablet Manufacturing. Their findings indicated that students who received videotape instruction performed better than those who received conventional method of teaching.

Conclusion

From the findings, it can be deduced that interactive video instructional medium produced more positive effect on students' psychomotor achievement. It is therefore a better method of instructional delivery for enhancing students' psychomotor achievement in Auto-Mechanics trades in Nigerian technical colleges and needs to be explored.

Recommendations

The following recommendations were made:

1. Teachers in technical colleges should make use of interactive video instruction in teaching Auto-Mechanics and other vocational subjects.

2. Government should provide computers and projectors in technical colleges to encourage and facilitate the use of interactive video instruction in technical colleges.
3. Curriculum planners should incorporate the use of interactive video instruction in teaching Auto-Mechanics and other vocational subjects.
4. Seminars, conferences and workshops should be organized to sensitize and train teachers on the use of interactive video instruction in teaching and learning of Auto-Mechanics and other vocational subjects.

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