EFFECT OF MULTIMEDIA INSTRUCTIONAL APPROACH ON ACHIEVEMENT OF AUTO-MECHANICS STUDENTS IN SCIENCE & TECHNICAL COLLEGES IN BENUE STATE, NIGERIA

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Abstract
The purpose of the study was to determine the Effect of Multimedia Instructional Approach on Achievement of Auto-mechanics Students in Science and Technical Colleges in Benue State, Nigeria. Three research questions and hypotheses guided the study. The pre-test-post-test non-equivalent control group quasi-experimental design was adopted. The population of the study comprised of 150 Part 1 (SSS 1) students in the auto-mechanics trade. Auto-Mechanics Achievement Test (AMAT) was used for data collection, and analyses were made using the mean, while ANCOVA was used to test null hypotheses at 0.05 level of significance. The study found that; those taught with multimedia instructional approach had higher mean achievement scores in the AMAT than their counterparts taught without multimedia, and no significant difference exists between the post-test mean achievement scores of students with respect to ability-level and gender. It was recommended among others that multimedia instructional approach should to be integrated in the teaching of auto-mechanics trade.

Keywords: *Multimedia, Achievement, Ability-level, Gender*

Introduction
Technical education is a skilled oriented training which facilitates the acquisition of practical and applied skills as well as basic scientific knowledge in a specific trade. Rhodes, (1999) saw technical education as the form of Education that gives a definite purpose and meaning to education by relating education to occupational goals, providing technical skills necessary for employment, developing abilities, attitudes, work habits and appreciation which contributes to a productive life. Prior to colonialism, technical skills were acquired through apprenticeship to serve the technological needs of local communities. As times went on, technical education was gradually developed as a means to responding to the sophisticated technological and industrial demands of Nigeria. Since then, it has received the backing of the National Policy on Education (NPE) in all series.

In the present dispensation, technical education is offered in science and technical colleges. The science and technical colleges are meant to produce skilled craftsmen/women for various industrial technical sectors. They offer various trades such as wood work, block laying and concreting, welding and fabrication, including auto-mechanics. Generally, auto-mechanics trade offers skills leading to the production of craftsmen/women, technicians, and other skilled personnel who will be enterprising and self-reliant [National Board for Technical Education (NBTE), 2001].

However, the quality of auto-mechanics craftsmen from science and technical colleges remains low. Unongo, (2008) laments that auto-mechanics graduates are neither employable nor possess the entry requirements for higher education. Supposedly, Ames

(1998) traced the menace to lack of interest on the part of learners, and uninteresting teaching strategies used by teachers.

Suffice it to say that, there is at least one generation gap between the ''Learners and the Teachers''. It is also important to recognize that the 21st century learners are indeed very different from what we were as students. They are born during the computer age, and are more fascinated by what appears on the screen than what appears on the paper. To this effect, Mayer, Fennell, Farmer, and Campbell (2004) noted that science and technology needs an integration of information and communication technology (ICT) into learning, teaching and assessment, as a means of providing a better education in science and technology. Federal Republic of Nigeria (FRN), (2004) considers ICT as divers set of technological tools and resources used to create, communicate, disseminate, store and manage information in electronic form. ICT can be used in education to create learning environments such as computer based laboratories, simulations, intelligent tutors, and multimedia.

Multimedia is a computer learning package which incorporates any three of text, audio, graphics and animation. According to Ryan, (2011) multimedia has the potential and functionality to enhance achievement and retention of knowledge compared to lecture method. It is proposed therefore that multimedia instructional approach would influence interest and achievement of auto-mechanics students with visual, auditory, or kinaesthetic learning styles. Supposedly, Moreno and Mayer (2000) expressed that people learn through the five senses and the contribution of each to the amount of what is learnt varies. Moreno and Mayer estimated that out of 100%; 1% is learnt through taste, 1.5% through touch, 3.5 through smell, 11% through hearing, and 83% through seeing. Putting hearing and seeing together indicates that 94% of learning can be achieved with multimedia instructional approach.

Achievement refers to intellectual and skills attained by a student in a particular subject, measured by a score obtained in a test. Achievement can be influenced by several factors including; teaching method, students' background, intelligence, interest, environment and motivation (Ryan, 2011). In a related development, a study carried out by Lowman (2006) to articulate the characteristics of good teaching and how it influences students' academic achievement found that, teaching method and teaching aids used by a teacher to present knowledge have significant influence on students' achievement irrespective of ability-level and gender. While ability level is the intellectual and skills differences that exist in between students subjected to a particular discipline, gender is the physical and behavioural difference that distinguishes individuals according to their functions in the reproductive process (Redmond, 2009). Generally, on ability-level, students are classified as low-ability level students and high-ability level students. The low-ability level students are those who obtain ≤ 50% in a given test, while the high-ability level students are those who obtain > 50% in a given test (Akem, 2006). While on gender, students are classified as male and female. It is therefore imperative to investigate if the use of multimedia instructional approach can enhance achievement of auto-mechanics students in science and technical colleges, irrespective of ability-level and gender.

Statement of the Problem
Poor performance of students in auto-mechanics trade as evident in the National Technical Certificate (NTC) examination has assumed a pathetic dimension. The National Business and Technical Examinations Board (NABTEB) (2011), (2012) Chief Examiners' Report, and results analyses by principals of science and technical colleges in Benue State has consistently indicated that, auto-mechanics students are persistently recording < 50% achievement. The

consequences of persistent poor achievement of auto-mechanics students are but not limited to; low academic advancement status, low productivity, unemployment, low income, and low quality of living, slow pace in national development. These critical points present a problem that requires attention. Since it is not clear whether auto-mechanics students in science and technical colleges in Benue State are usually taught with multimedia instructional approach, it is imperative to investigate if multimedia instructional approach would influence better achievement of students in auto-mechanics trade.

Purpose of the Study
The purpose of the study is to investigate the effect of multimedia instructional approach on achievement of auto-mechanics students in science and technical colleges in Benue State, Nigeria. Specifically, the study sought to:
(i)   Determine the mean achievement score of students exposed to multimedia instructional approach with their counterparts exposed to lecture method.
(ii)   Compare the mean achievement score of low-ability level students with high-ability level students exposed to multimedia instructional approach.
(iii) Determine the influence of gender on academic achievement of auto-mechanics students when taught with multimedia instructional approach.

Research Questions
(i)   What are the mean achievement scores of students exposed to multimedia instructional approach over their counterparts exposed to lecture method?
(ii)   What is the mean achievement score of low-ability level students compared with high-ability level students exposed to multimedia instructional approach?
(iii) What is the influence of gender on academic achievement of auto-mechanics students when taught with multimedia instructional approach?

Research Hypotheses
(i)   There is no significant difference between the mean achievement score of students exposed to multimedia instructional approach and their counterparts exposed to lecture method.
(ii)   There is no significant difference between the mean achievement score of low-ability level students and high-ability level students exposed to multimedia instructional approach.
(iii) There is no significant difference between the mean achievement score of male and female students exposed to multimedia instructional approach.

Research Methods
The study adopted the Quasi-experimental design. Specifically, the pre-test-post-test non-equivalent control group design was used. The study was conducted in Benue State where 150 (been the sum total of Part One students, equivalent to Senior Secondary School 1), were recruited into the study from five science and technical colleges that offer auto-mechanics trade. No sample was taken, in order to obtain a more justifiable result. Hence the population of the study constituted the sample. A twenty item multiple choice Auto-Mechanics Achievement Test (AMAT) was administered on the control, and experimental groups. All the items were drawn from the past questions on Engine Maintenance and Refurbishing in the NTC Examination conducted by NABTEB Nigeria, from 2006 to 2012. A pre-test was conducted to ascertain the intelligence status of the groups. Those who scored ≤ 50% and those who scored > 50% were classified as low-ability, and high-ability level students respectively. Thereafter, the experimental groups were taught using the Auto-mechanics Multimedia Package (AMP) while the control groups were taught using the lecture method. Finally, a post-test was administered on the control, and experimental groups and

the scores of both groups in pre-test and post-test were recorded and compared. The research questions were answered using the mean of the test scores, while Analysis of Covariance (ANCOVA) was used to test the null hypotheses at 0.05 level of significance, using the Statistical Package for Social Sciences (SPSS). Where the P- value was greater than the 0.05 level of significance (P- value > 0.05 level of significance), the null hypothesis was therefore accepted. But where reverse was the case (P- value < 0.05 level of significance); the null hypothesis was rejected.

Results

Table 1: Mean for pre-test and post-test auto-mechanics achievement test (AMAT) scores for the control and experimental groups

Descriptive Statistics		
Group	**N**	**Mean**
Control Group Pre-Test	79	9.3600
Experimental Group Pre-Test	71	9.4933
Control Group Post-Test	79	10.8800
Experimental Group Post-Test	71	17.6533
Valid N (listwise)	75	

The result presented in Table 1 above shows that the control group and the experimental group had the pre-test mean scores of 9.36 and 9.49 respectively. The difference in the pre-test is negligible. However, the post-test mean scores for the control group and the experimental group were 10.88 and 17.65 respectively. The difference in their mean post-test score of 6.77 indicated that, the experimental group recorded higher achievement than their control group counterparts in Auto-Mechanics Achievement Test (AMAT).

Table 2: Mean achievement scores of low-ability level students and high-ability level students taught using multimedia instructional approach

Descriptive Statistics		
Ability Level		
	N	**Mean**
Low Ability Level Students	25	17.6667
High Ability Level Students	46	17.6458
Valid N (listwise)	25	

The result presented in Table 2 shows that 71 students comprising of 25 low-ability and 46 high-ability level students were taught using multimedia instructional approach in which, the low-ability level students had mean achievement score of 17.67 while the high-ability level students had mean achievement score of 17.65. The difference in their mean achievement score of 0.02 is not statistically significant hence indicating that both the low-ability level students and the high-ability level students performed equally when taught using multimedia instructional approach.

Table 3: Mean Achievement Scores of Male and Female students taught using Multimedia Instructional Approach

Descriptive Statistics		
Gender	**N**	**Mean**
Male	50	17.5686
Female	23	17.8333
Valid N (listwise)	23	

The result presented in Table 3 above shows that 71 students comprising of 50 male and 23 female, were taught using multimedia instructional approach in which, the male students had mean achievement score of 17.57 while the female students had mean achievement score of 17.83. The difference in their mean achievement score of 0.26 is not statistically significant hence indicating that both the male and female students performed equally when taught using multimedia instructional approach.

Hypothesis 1: There is no significant difference between the mean achievement score of students exposed to multimedia instructional approach and their counterparts exposed to lecture method.

Table 4: ANCOVA Test of between the experimental group and the control group mean achievement scores

Source	Type III Sum of Squares	df	Mean Square	F-value	p-value
Corrected Model	.409[a]	1	.409	.112	.739
Intercept	770.500	1	770.500	210.763	.000
CGPT	.409	1	.409	.112	.739
Error	266.871	73	3.656		
Total	20341.000	75			
Corrected Total	267.280	74			

From Table 4; the Sig. P-value of $0.00 < 0.05$. It indicates that there is significant difference, thus rejecting the null hypothesis one (Ho_1). This implies that there is significant difference in the post-test mean achievement score of auto-mechanics students in science and technical colleges exposed to multimedia instructional approach and their counterparts exposed to lecture method.

Hypothesis 2: There is no significant difference between the mean achievement score of low-ability level students and high-ability level students exposed to multimedia instructional approach.

Table 5: ANCOVA Test of between the mean achievement scores of low-ability level students and high-ability level students exposed to multimedia instructional approach

Source	Type III Sum of Squares	df	Mean Square	F	p-value
Corrected Model	6.804[a]	1	6.804	1.907	.180
Intercept	10.368	1	10.368	2.906	.101
High Ability-Level Students	6.804	1	6.804	1.907	.180
Error	89.196	25	3.568		
Total	8523.000	27			
Corrected Total	96.000	26			

From Table 5; the Sig. P-value of $0.10 > 0.05$. It indicates that there is no significant difference, thus accepting the null hypothesis two (Ho_2). This implies that there is no significant difference in the post-test mean achievement score of low-ability level students and high-ability level students of auto-mechanics in science and technical colleges exposed to multimedia instructional approach.

Hypothesis 3: There is no significant difference between the mean achievement score of male and female students exposed to multimedia instructional approach.

Table 6: ANCOVA Test of between the mean achievement scores of male and female students exposed to multimedia instructional approach

Source	Type III Sum of Squares	df	Mean Square	F	p-value
Corrected Model	9.366[a]	1	9.366	3.878	.062
Intercept	5.225	1	5.225	2.163	.155
Female	9.366	1	9.366	3.878	.062
Error	53.134	22	2.415		
Total	8056.000	24			
Corrected Total	62.500	23			

From Table 6; the Sig. P-value of 0.16 > 0.05. It indicates that there is no significant difference, thus accepting the null hypothesis three (Ho_3). This implies that there is no significant difference in the post-test mean achievement score of male and female students of auto-mechanics in science and technical colleges exposed to multimedia instructional approach.

Discussion
The results presented in Table 1 indicated that there was no difference between the mean pre-test scores of both control and experimental groups. However, their post-test mean achievement scores showed that the experimental group and the control group obtained mean scores of 17.65 and 10.88 respectively. The difference in their mean post-test score of 6.77 indicated that the experimental group achieved higher than their control group counterparts. This result was confirmed on null hypothesis one (Ho_1) presented in Table 4 that, there is significant difference between the post-test mean achievement score of auto-mechanics students in science and technical colleges exposed to multimedia instructional approach and their counterparts exposed to lecture method. The significant difference is attributed to the treatment given to the experimental group. It implies therefore that, multimedia instructional approach has significant effect on auto-mechanics students' achievement in science and technical colleges in Benue State, Nigeria. This finding is in line with Ryan (2011) who confirmed that multimedia has the potential and functionality to enhance achievement and retention of knowledge compared to lecture method.

The finding from the descriptive statistics presented in table 2 shows that both the low-ability level students and the high-ability level students performed equally when exposed to multimedia instructional approach. The null hypothesis two (Ho_2) also confirmed that, no significant difference exists between the post-test mean achievement score of low-ability level students and high-ability level students of auto-mechanics exposed to multimedia instructional approach. Similarly, the result of the descriptive statistics presented on table 3 also shows that, both male and female students performed equally when exposed to multimedia instructional approach. This finding was confirmed in null hypothesis three (Ho_3) that, no significant difference exists between the mean achievement score of male and female students of auto-mechanics in science and technical colleges exposed to multimedia instructional approach. All the findings presented on tables 2 and 3, confirmed on Ho_2 and Ho_3 respectively, are consistent with Lowman, (2006) that teaching method and teaching aids used by a teacher to present knowledge have significant influence on students' achievement irrespective of ability level and gender. To this end, multimedia instructional approach which motivates students to learn by providing an authentic learning environment,

thereby influencing students' achievement should therefore be integrated with lecture method.

Conclusion

Comparing lecture method with multimedia instructional approach employed for the study, there exist a difference in the post-test mean achievement score of the students in the control and the experimental groups. The results statistically indicate that multimedia instructional approach has significant effect on auto-mechanics students' achievement irrespective of ability-level and gender. This means that the effect of students' ability-level and gender can be greatly neutralized with multimedia instructional approach. In conclusion therefore, multimedia instructional approach which has significant effect on students' achievement of auto-mechanics students in science and technical colleges in Benue State is more effective in helping students to learn auto-mechanics trade than the lecture method.

Recommendations

Based on the findings of this study, the following recommendations were made:
(i)   Multimedia instructional approach should to be integrated in the teaching of auto-mechanics trade.
(ii)   Workshops should be organized for technical teachers on development and application of multimedia packages for enhanced teaching and learning of auto-mechanics trade.
(iii)   Visual libraries should be provided in science and technical colleges for enhanced learning of auto-mechanics trade.

References

Akem, J. A. (2006). *Evaluation techniques in schools and colleges: A hand book for teachers.* Makurdi: Selfers Publications.

Ames, C. (1998). Classroom goals, structures, and students' motivation. *Journal of Educational Psychology, 84*(3), 264 - 271.

FRN (2004). *National policy on education.* Lagos: NERDC Press.

Lowman, J. (2006). Characteristics of exemplary teacher. *New Dictions for Teaching and Learning,* 23(64), 112 - 119.

Mayer, R. E., Fennell, S., Farmer, L., & Campbell, J. (2004). A personalization effect in multimedia learning: students learn better when words are in conversational style rather than formal style. *Journal of Educational Psychology, 96*(2), 389 - 395.

Moreno, R., & Mayer, R. E. (2000). Engaging students in active learning: The case for personalized multimedia messages. *Journal of Educational Psychology, 92,* 724 – 733.

NABTEB (2011). *May/June 2011 NTC/NBC Examinations: Chief Examiner's Report.* Benin-City: Festa Printing Press.

NABTEB (2012). *May/June 2012 NTC/NBC Examinations: Chief Examiner's Report.* Benin-City: Festa Printing Press.

NBTE (2001). *Motor vehicle mechanics' work national technical certificate (ntc) and advanced national technical certificate (ANTC): Curriculum and course specifications.* UNESCO – Nigeria Project 2001.

Redmond, W. A. (2009). *Sex. Microsoft® Encarta® 2009 [DVD].* Redmond, W. A: Microsoft Corporation, 2008.

Rhodes, J. A. (1999). *Alternative to a decent society.* New York: Howard W. Sams

Ryan, T. G. (2011). *The effects of multimedia technology on learning.* Unpublished Master's Thesis, Abilene Christian University. Retrieved from http://www.acu.edu/technology/mobilelearning/d

Unongo, J. (2008). Technical education in Nigeria and the challenges of globalization. *Oju Journal of Vocational and Technical Education* (1)1.