

# **Effects of Multimedia Instruction on Student's Academic Achievement and Retention in Auto Mechanics at Technical Colleges**

**Umar, I. Y., Idris, A. M., Audu, R., Arah, A. S., Yusuf, E. and Beji, A. A.**

Department of Industrial and Technology Education,  
Federal University of Technology, Minna, Niger State  
**Phone: 08066059717**

## **Abstract**

*The study investigated the effects of multimedia instruction on student's achievements and retention in auto-mechanics at technical colleges in Niger state, Nigeria using quasi experimental pretest posttest non-equivalent research design. The population for the study consisted of 94 NTC II technical auto-mechanics students. Two research questions were raised and answered as well as two hypotheses were formulated and tested at 0.05 level of significance. The instruments used for data collection were Auto Mechanics Achievement Test (AMAT). The reliability Coefficient of AMAT was found to be 0.83 using Pearson Product Moment Correlation coefficient. Mean was used to answer the research questions while t- test was employed to test the hypotheses. Findings from the study revealed that multimedia instruction is more effective in improving student's achievement and retention in auto-mechanics than conventional method. There was significant difference in the student's achievement and retention mean scores in favouring students in the experimental group. It was therefore recommended that teachers in technical colleges should adopt multimedia instruction in teaching auto-mechanics.*

**Key words:** Multimedia, Instruction, Achievement, Retention, Auto-Mechanics

## **Introduction**

Auto-mechanics involves the application of specific knowledge in the design, selection of materials, construction, operation and maintenance of automobiles. Auto-mechanics is one of the trades offered in technical colleges (Federal Republic of Nigeria, 2013). The programme for auto-mechanics technology in technical colleges is designed to produce competent craftsmen in auto-mechanics trades. According to the National Board for Technical Education (NBTE, 2009), auto-mechanics craftsmen are expected to test, diagnose, service and completely repair any fault relating to the conventional automobile assembly main units and systems by following the manufacturer's specifications. The teaching and learning of auto mechanics as well as technical education in general, nowadays, encounters several challenges, the most peculiar of which are over-population, change of teacher's role, lack of staff and equipment, and inappropriate

instructional methods (Aloraini, 2005). This drove the teaching staff of auto mechanics to use the modern teaching technologies to address the challenges. To improve the educational productivity, some of the teaching staff sought to embrace the use of multimedia instruction (Ibrahim, 2009).

Multimedia instruction, according to Mayer and Moreno (2003), can be defined as presenting both words and pictures that are intended to foster learning. To Mayer and Moreno (2003), the word can be printed (e.g. on-screen text) or spoken (e.g., narration). The picture can be static (e.g., illustrations, graphs, charts, photos, or maps) or dynamic (e.g., animation, video, or interactive illustrations). An important example of multimedia instruction in technical college auto mechanics lesson is a computer-based narrated animation that explains the operation of automobile lighting system operation (Chuang, 1999), lightning formation (Moreno & Mayer, 2000), and wave motion (Kuti, 2006). According to Adegoke (2010), Chuang (1999), Kuti (2006), Moreno and Mayer (2000), one promising approach in addressing instructional challenges involves multimedia presentations of explanations in visual and verbal formats such as presenting a computer-generated animation synchronized with narration or on-screen text. However, multimedia is now offering the educational system a tool for effective teaching and learning.

Nevertheless, Adegoke (2010) opined that multimedia is increasingly being used in many developed countries including Nigeria due to the advantages derived from using multimedia instruction which includes among others; complicated topics can be explained and understood better with the aid of pictures, graphs, animations and simulations as well as complex concepts are presented in small, chronological steps as a means to improve students' ability to comprehend information in a meaningful way (Neo and Neo, 2001). Research shows significant

links between multimedia instruction and student's academic achievement. Schools that employ the use of multimedia instruction have higher student attendance and lower dropout rates that leads to greater academic achievements and retention (Maha, 2008).

Academic achievement connotes performance in school subject as symbolized by a score on an achievement test. Epunnah (1999) defined performance as the learning outcome of students which include the knowledge, skills and ideas acquired and retained through their course of studies within and outside the classroom situation. Academic achievement is an indication of level of retention ability of the students. However, retention is the ability to reproduce the learnt concept when the need arises. Hornby (2000) defines retention as the ability to remember experiences and things learnt. According to Gatlin (1998), for knowledge to be retained for a long time by the learners the teachers must use effective instructional techniques that involves the use of multimedia in the classroom. Osemmwinyen (2009) found that student's achievements and retention could be aroused and retained through the use of an appropriate instructional media like multimedia. Moreover, Aloraini (2012) confirmed that multimedia instruction increases student's retention level.

Nigerian governments invest hugely on technical colleges programme with the aim of improving the image and performance of technical college students. Yet, the performance of the students in auto mechanics has never been encouraging in Niger state. NABTEB chief examiner's report indicated that the failure rate in auto mechanics in the years 2011 and 2012 were due to poor instruction techniques and lack of students exposure to practical or media instruction (NABTEB, 2011 and 2012). Moreover, it has been discovered that the persistent poor academic achievement as well as retention in auto mechanics and other technical subjects is as a result of the inappropriate teaching methods adopted by teachers (Ogbuanya and Owodunni, 2013). This

study therefore, focused on finding out the effects of multimedia instruction on student's academic achievement and retention in auto mechanics, especially the students of technical colleges, in comparison with their colleagues who benefit from the same curriculum through conventional instructional method.

### **Research Questions**

The following research questions were answered in the study

1. What is the student's mean achievement score in auto mechanics?
2. What is the student's mean retention score in auto mechanics?

### **Hypotheses**

The following null hypotheses which were tested at .05 level of significance guided this study:

1. **H<sub>01</sub>**: There is no significant difference between the achievements mean score of students taught using multimedia instruction and students taught using conventional instruction.
2. **H<sub>02</sub>**: There is no significant difference between the retention mean score of students taught using multimedia instruction and students taught using conventional instruction.

### **Methodology**

The design of the study was quasi-experimental research design. The research makes use of pre-test, post-test non-equivalent control group design. The researcher randomly assigned intact classes to experimental and control groups. This was necessary in order not to disrupt the normal classes of the students and the school time-table. The population of this study comprises 94 NTC II students of auto mechanics in the two technical colleges (Mamman Kontagora Technical College, Pandogari and Government Technical College, Bida) in Niger state that were randomly

selected for the study. The instrument for data collection for this study was Auto Mechanics Achievement Test (AMAT) which was used to test the achievement as well as retention of students in auto mechanics based on Curriculum for Motor Vehicle CMV19 (Auto electricity) module in the curriculum. It consists of 20 multiple choice items with five options. The school that was assigned the multimedia instruction served as experimental group while the school that the conventional lesson was used in teaching the students served as the control group. Pretest were administered to both the experimental and control groups after which proper teaching commenced by using the prepared lesson plans. Each lesson lasted for 40 minutes and the treatment lasted for 4 weeks. At the end of the treatment, a posttest was administered on both groups with the AMAT and after two weeks interval, retention test was administered to both groups. Data collected for this study were analyzed using Microsoft excel to find mean scores and standard deviation to answer the research questions and the null hypotheses were tested using Graph pad software.

## Results

### Research Question 1

What is the student's mean achievement score in auto-mechanics?

**Table 1**

*Mean and standard deviation of student's pretest and posttests scores in Auto-Mechanics Achievement Test (AMAT) for control and experimental group.*

Groups	N	Pretest scores		Posttest scores		Mean Gain
		Mean	SD	Mean	SD	
Control	50	14.92	0.72	15.92	1.03	1.00
experimental	44	14.82	0.73	18.57	1.04	3.75

## Research Question 2

What is the student's mean retention score in auto mechanics?

**Table 2**

*Mean of posttest and retention scores of students in Auto Mechanics Achievement Test (AMAT) for experimental and control groups*

Groups	N	Posttest scores		Retention scores		Mean Gain
		Mean	SD	Mean	SD	
Control	50	15.92	1.03	15.02	0.89	-0.90
experimental	44	18.57	1.04	18.60	0.81	0.03

## Hypotheses 1

**H<sub>01</sub>:** There is no significant difference between the achievements mean score of students taught using multimedia instruction and students taught using conventional instruction.

**Table 3**

*Comparison between the results of the posttests for the control and experimental groups.*

Group	N	Mean	SD	df	t-value	Sig (2 tail)
Control	50	15.92	1.03	92	12.38	0.214
experimental	44	18.57	1.04			

Data on table 3 shows that there is statistical significant difference between the mean achievement scores of students in control group and experimental group in auto-mechanics achievement posttest.

## Hypotheses 2

**H<sub>02</sub>:** There is no significant difference between the retention mean score of students taught using multimedia instruction and students taught using conventional instruction

**Table 4**

*Comparison between the results of retention tests for the control and experimental groups*

Group	N	Mean	SD	df	t-value	Sig (2 tail)
Control	50	15.66	0.89	92	15.28	0.177
Experimental	44	18.36	0.81			

Data on table 4 shows that there is statistical significant difference between the mean retention scores of students in control group and experimental group in auto-mechanics retention test.

## Discussion of findings

The data presented on students mean achievement scores in auto mechanics revealed that posttest mean scores of multimedia instruction on student's achievements in auto mechanics is higher than the posttest mean scores of conventional method. The findings relates to the findings of Tabers and Martens (2004) who opine that schools that employ the use of multimedia instruction have higher student attendance and lower dropout rates that leads to greater academic achievements. The data presented on the student's mean retention score in auto mechanics revealed that mean scores of multimedia instruction on student's retention in auto-mechanics is higher than the student's retention mean scores of conventional method. This finding concord with the assertion of Aloraini (2012) who confirmed that multimedia instruction increases student's retention level.

Comparison of student's posttests scores confirmed that the difference between multimedia instruction and conventional instruction in student's achievement was significant. The findings

concord with the findings of Abu Yunis (2005) that shows significant statistical differences in the average of academic achievement of the experimental and control groups in the test conducted after the experiment in favor of experimental group. Comparison of student's retention scores confirmed that the difference between multimedia instruction and conventional instruction in student's retention was significant. The findings holds similar view with the findings of Salem (2000) which shows statistical significant differences in the average grades of the experimental and control groups in favor of the experimental group after teaching the program.

### **Conclusion**

The need to find the best method to assist auto mechanics students in learning auto mechanics and improve their performance at technical colleges cannot be over emphasized. The study determined the effect of multimedia instruction on academic achievement and retention of auto mechanics students in technical colleges. This study has found out that multimedia instruction is more effective in improving student's achievement and retention in auto mechanics than conventional method. The study revealed that there is significant difference between multimedia instruction and conventional instruction method on student's achievements and retention.

These results therefore showed that multimedia instruction is a viable teaching method for auto mechanics. It is hoped therefore, that if multimedia instruction is taken into consideration in the teaching of auto mechanics in technical colleges, the craftsmen trained will graduate with needed skills that will enable them to be self employed, gainfully employed in the industries or further their studies in higher institutions.



## Recommendations

Based on the findings which indicated the effectiveness of multimedia instruction as compared to the conventional methods of teaching, the study recommends the following:

1. Technical colleges teachers should adopt the use of multimedia instruction in teaching auto mechanics
2. Governments at all level should encourage the use of multimedia instruction in schools by providing multimedia tools
3. Conducting more studies on multimedia instruction in the academic realm above the technical college level.
4. National Board for Technical Education should carry out a review of auto mechanics trade curriculum for technical colleges with a view to incorporate multimedia instructional technique into the teaching auto mechanics

## References

- Adegoke, B. A. (2010). Integrating animations, narrations and textual materials for improving student's learning outcomes in senior secondary school physics. *Electronic Journal of Research in Educational Psychology*, 2(1), 56-65.
- Abu Yunis, A. (2005). *The effectiveness of multimedia software for teaching engineering in the second row preparatory*. Unpublished Ph.D. thesis. University of Damascus, Damascus.
- Aloraini, S. (2012). The impact of using multimedia on student's academic achievement in the College of Education at King Saud University. *Journal of King Saud University – Languages and Translation*, 24, 75–82.
- Aloraini, S. I. (2005). *Distance learning*. Dammam, Kingdom of Saudi Arabia; Alretha Press.
- Chuang, Y. (1999). Teaching in a multimedia computer environment: A study of the effects of learning style, gender and math achievement. *Interactive multimedia electronic Journal of Computer – Enhanced Learning*. Retrieved December 15, 2000 from <http://ime.wfu.edu/articles/1999/1/10/index.asp>
- Epunnah, A. D. (1999). *Influence of school environmental variables on academic performance as perceived by students*. Unpublished M.Ed, Thesis, University of Nigeria, Nsukka.

- Federal Republic of Nigeria. (2013). National Policy on Education. 4th ed. Nigerian Educational Research and Development Council (NERDC) Press, Lagos, Lagos State, Nigeria
- Gatlin, L.S. (1998). *The effect of pedagogy informed by constructivism: a comparison of student's achievement across constructivist and traditional classroom environment*. Unpublished Doctoral Dissertation. University of New Orland.
- Hornby, A. S. (2000). *Oxford advanced learners dictionary*. Oxford university press
- Ibrahim, A. (2009). *Preparation and Production of Interactive Multimedia Software, Second Edition*. Tanta, Egypt: Delta Computer Technology.
- Kuti, J.B. (2006). *Effect of multimedia instructional strategy on senior secondary students' learning outcomes in physics in Ogun state, Nigeria*. Unpublished M.Ed project, University of Ibadan, Ibadan
- Maha, D. (2008). *The impact of the use of software decision math produced locally on collection of the average second grade students in Riyad*. Unpublished Master Thesis, King Saud University, Riyadh.
- Mayer, R. E. & Moreno, R. (2003). Nine ways to reduce cognitive load in multimedia learning. *Educational Psychologist*. 38, 43 – 52.
- Moreno , R. & Mayer, R.E. (2000). A coherence effect in multimedia learning. The case of minimizing irrelevant sounds in the design of multimedia instructional messages. *Journal of Educational Psychology*, 97, 117-125
- National Board for Technical Education (NBTE). (2009). *National technical certificate (NTC) and advanced national technical certificate (antc) curriculum and module specifications in motor vehicle mechanics*. NBTE Kaduna, Kaduna State, Nigeria.
- National Business and Technical Examinations Board. (2011). *Chief examiner's report on the May/June NBC/NTC*. Benin: Government press.
- National Business and Technical Examinations Board. (2012). *Chief examiner's report on the May/June NBC/NTC*. Benin: Government press.
- Neo, M., & Neo, K. (2001). Innovative teaching: Using multimedia in a problem-based learning environment. *Educational Technology and Society* 4, 56-75.
- Ogbuanya, T. C and Owodunni, A. S. (2013). Effects of reflective inquiry instructional technique on students' achievement and interest in radio television and electronics works in technical colleges. *IOSR Journal of Engineering*, 3 (11), 01-11.
- Osemwinyen, A. C. (2009). *Effects of e-learning on retention and achievement in secondary school mathematics in Abuja, Nigeria*. Unpublished Ph.D thesis. University of Nigeria, Nsukka.

Salem, H. (2000). *The impact of the use of computers as an assistant in the teaching of statistics education on the development of statistical skills among students in third grade secondary trading*. Unpublished MA Thesis. University of Ain Shams, Cairo.

Tabers, H. K. and Martens, R. L. (2004). Multimedia instructions and cognitive load theory: Effects of modality and cueing. *British Journal of Educational Psychology* 74, 71-81.