

# Effect Of Computer-Assisted Instruction On Students' Psychomotor Achievement In Auto-Mechanics Technology In Technical Colleges In Delta State

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**Abstract:** *The poor achievement of students in technical colleges in Nigeria has been a major concern to researchers. Among all the factors susceptible to that, the use of ineffective instructional methods by teachers appears to be one of the major threats to the psychomotor achievement of students. This demands that teachers in technical colleges would adopt instructional methods that could enhance students' psychomotor achievement in auto mechanics technology in technical colleges. The study investigated the effect of computer-assisted instruction on students' psychomotor achievement in auto-mechanics in technical colleges in Delta State. Quasi-experimental design was used for the study. Three research questions were answered and two null hypotheses were tested at 0.05 level of significance. Population of the study was 128 National Technical Certificate (NTC) year 1 Auto-Mechanics students in state owned technical colleges. Purposive sampling technique was used to select four schools out of the six technical colleges, which gave a sample of 101 students. The instrument for data collection was Auto-Mechanics Achievement Test (AMAT). The instrument was face and content validated by three experts. Test-retest method was used to collect data, which was calculated using Pearson product moment correlation coefficient which yielded 0.81. The treatment was conducted using computer-assisted instruction (CAI) and lecture demonstration teaching method (L/DTM) which lasted for four weeks while the pre-test and post-test were administered respectively. The results were collated and analyzed. Whilst, Arithmetic mean and standard deviation were used to answer the research questions, Analysis of Covariance (ANCOVA) was used to test the null hypotheses at 0.05 level of significance. Findings of the study revealed that students taught auto-mechanics using CAI achieved significantly higher and retained better than those taught using L/DTM. Based on the findings, it was concluded that CAI is an effective and efficient mode of instruction with capacity to improve students learning outcome in auto-mechanics trade in technical colleges. Consequently, it was therefore recommended among others that technical teachers should use CAI in teaching auto-mechanics in order to enhance learning, and ultimately improve students' academic achievement in the trade.*

**Keywords:** *Computer-Assisted Instruction, Students' Psychomotor Achievement, Auto-Mechanics Technology, Technical Colleges*

## I. INTRODUCTION

The increasing industrialization in modern times has caused knowledge and skills in technical education to become

highly indispensable in everyday life. These needs for knowledge and skills brought in a replacement of a new understanding of knowledge construction and the reciprocal relationship between the teacher and the learner. In view of

these needs for changes in Nigeria educational system, Federal Republic of Nigeria (FRN, (2013) stipulates that Technical Education is that level of education obtained at technical college level designed to prepare individuals to acquire practical skills, basic scientific knowledge and attitudes required as craftsmen and technicians at sub professional level. Technical colleges are established institutions where students are trained to obtain relevant knowledge and skills in different occupations for employment in the world of work (National Business Technical Education Board, NABTEB, 2012). Federal Republic of Nigeria (2013) also stated that technical college is a segment of technical and vocational education programme designed to train manpower in the applied sciences, technology and business particularly craft, advanced craft and technician levels among others. This may involve the manipulation of materials or objects in form of task performance, the simple use of spanner to tighten or loosen a bolt and the complex process of dismantling and assembling an engine as applicable in auto-mechanics trades' programme. These culminated in the acquisition and optimization of creative ingenuity that dictates the trend of diversification and industrialization in this era of information explosion (Okoye, Okoye, & Okwelle, 2015). Evidently, the knowledge acquired from these technical trades could help the graduates of auto-mechanics trade to secure gainfully employment or establish theirs. Technical colleges run different programmes such as auto-mechanics trade, electrical trade among others.

Auto-mechanics trade programmes at technical college level involves the application of scientific knowledge in the design, selection of materials, construction, operation, maintenance and repairs of automobiles (Okoye, 2019; Audu, Azlan and Muhammad, 2014). It is a skill oriented subject taught with emphasis on theory and practice. The philosophy of auto-mechanics is to produce competent craftsmen and master craftsmen in automobile trade who would be able to carry out routine services, conduct tests and diagnoses and repair various types of vehicle components. Similarly, auto-mechanics may employ a wide range of techniques and tools in conducting vehicle diagnostic test, ranging from brief physical checks to a comprehensive but computer-based diagnostic analysis. Hence, the need for appropriate teaching and learning of auto-mechanics in schools, in order to turn out qualified graduates to fit into the world of work. This would in addition to enhancing students' academic achievement, qualifies them for higher level of education that would heighten their knowledge and know-hows in the field of technology (Okoye, & Okoye, 2019). To make the concepts of auto-mechanics subject more concrete and real, it becomes imperative to employ Digital natives' theory. According to Prensky (2001) Digital natives are those personalities born and raised in a digital and media-saturated world. Since they are immersed in technology-driven environment from their early years, enabled them to subtly acquire requisite technological skills and exploit them creatively. Through this medium, learners acquired skills the same way they pick up their first language. In contrast, Prensky (2001) contends that *digital immigrants* are developing digital skills that would always be like learning a second-language rather than being innate. Incidentally, the natives are being taught by immigrants who

are, in effect, not of the same language. It could be deduced from this narrative the necessity for technical teachers to radically re-structure the classroom or learning environment in a way to incorporate computer-assisted instruction to facilitate impartation of requisite competence in learners.

Computer-Assisted Instruction (CAI) simply stands for the type of instruction aided or carried out with the help of a computer. It involves the incorporation of computer resources and technology-based practices into the daily routines, work, and management of teaching and learning. CAI refers to the use of computer as a tool in teaching and learning. It includes drill and practice, tutorials, simulations, instructional management, supplementary exercises, database management, word processing and other types of computer applications. Adolphus and Aderonmu, (2012) posited that the computer can be used as a tutor to teach students, as a tool for students to use as they would use other educational tools, and as a tutor that students can programme to teach instructions. The use of computers in the teaching and learning process is an important advances in making the highest quality of education universally available. This invaluable change has brought forth a fresh perspective, innovativeness, and creativity in the teaching and learning process. It is essential that technical education teachers devise other means by which knowledge and skills could be imparted into learners by taking advantage of modern technologies; since they enable learners understand learning materials quickly and precisely.

Computers offer exciting approaches to teaching that were not even dreamt of two decades ago but the extent to which the educational potential of computer technology would be realized is yet to be seen (Chukwu, 2017). Ayonmike (2014) observed that Computer technology has caught the attention of many researchers and educators as such computer-based instructional applications are considered effective alternative to traditional or conventional teaching method. Obviously, the current trends in the use of computer facilities and resources in research globally have optimally enhanced learning and knowledge transfer. Orijika (2004) opined that many exercises that depart from traditional method are now readily accessible on the web, even although some teachers do not use the facilities. Furthermore, advancement in technology has recently changed both the education system and the society at large. That is why the increasing importance of skilled persons not only as users of knowledge but producers of knowledge puts additional responsibilities on technical teachers to incorporate CAI in order to improve psychomotor achievement of students.

Achievement connotes performance in school subject as symbolized by scores or marks on an achievement test or examination. Achievement of a student is defined as the learning outcome of the student which includes knowledge, skills and ideas acquired and retained through the course of study within and outside the classroom situations (Ajai, Imoko, & Okwu, 2013; Okoye, 2019). It is used to measure individuals or learners' level of skill accomplishment or knowledge gained in a specific area over a given time. The student's psychomotor skills, commonly called manual or physical skills are normally developed through laboratory/workshop activities. Sequel to this, psychomotor achievement is appropriate in determining the efficacy of

instruction, and also useful in testing the retention of information and skill. Chukwu (2017) viewed psychomotor achievement of student as the ability of the student to study and remember facts and being able to communicate the knowledge practically in examination condition. Therefore, achievement in a particular subject is usually interpreted as low or high according to letters or grades assigned to the raw scores obtained by the students. For instance, if students' examination result shows several A and B grades, people tend to conclude that such students are intelligent and high achievers whereas those whose scores are below these grades are regarded as less intelligent and are low achievers. Apparently, one can estimate therefore how much a learner has learnt the content of an instruction simply from the learner's test score.

There are students with different academic ability levels, which are categorized as low, medium and high ability levels. Students with marks from 0% to 39% are low-level ability; those with 40% to 69% are middle-level ability and those with 70% and above are high-level ability (Oyenuga, 2010). According to Nwosu (2009), low level ability students are said to be the group of students who perform poorly in tests and examinations, are easily distracted, less able to set about tasks in an organized manner and less able to control their own basic impulses and their destinies. Oyenuga further described the low-level ability students as students whose academic potential fall below class average while their achievement is described as poor. On the other hand, high-level ability students are referred to those students who do not ascribe their fate to luck or to vagaries of chance but rather to their own personal decisions and efforts; such characterize high level abilities. Incidentally, studies have shown that method of instructional delivery greatly influences learning outcomes. In technical colleges, lecture/demonstration teaching method (L/DTM) is predominantly used in teaching.

Lecture/demonstration teaching method (L/DTM) is known as the traditional talk-chalk method of teaching. Here the teacher does the talking while students serve as receivers only by listening and taking down notes. Eze and Osuyi (2018) described lecture/demonstration teaching method as the type of teaching method in which the teacher is the principal actor while the learners watch with the intention to act later. In demonstration teaching method, the role of the teacher is to illustrate how to do something or illustrate a principle first by explaining the nature of the act verbally, followed by demonstrating the act in a systematic manner and later the students repeat the act. Odundo and Gunga (2013) outlined some advantages of L/DTM to include; teacher covering a lot lesson in a period, dissemination of large quantity of information to students in a short period of time, and non-use of any equipment and laboratory. Moreover, the method guarantees quality instructional delivery by teachers, and also encourages self-discovery learning as well as promotes students' listening and communication skills.

In spite the outlined advantages of L/DTM, it also has several disadvantages, which include: it shows no regard for individual differences among learners and does not provide opportunity for adequate class participation in the teaching and learning process. As a result, students learn comparatively little from what has been taught as they only hear and see the

teacher. In most cases, the students are passive and always bored. It is therefore, noteworthy that continual use of L/DTM in Nigerian schools would reduce the ability of students to grasp relevant concepts (Mba, 2012); and subsequently culminate in dissatisfaction, inadequate knowledge development, low interest and high dependency of students on teachers. This could hamper students' ability to retain learning as well as apply them in new situations. Therefore, to be effective in the 21<sup>st</sup> century classroom, technical teachers need to embed digital technologies in all their pedagogical practices.

Acknowledging that CAI package could transform the classroom environment though collaborative, active and interactive process, which could foster effective teaching and learning episodes especially in auto-mechanics trade which would in turn improve the performance of technical colleges students. This assumption prompted the researchers to determine the effects of CAI on psychomotor achievement of auto-mechanics technology students in technical colleges.

## II. STATEMENT OF THE PROBLEM

With the advances in automobile technology, computerization and digitalization, various methods of delivering instruction have been devised and used in the teaching and learning process to overcome most instructional problems in education system. As such, acquisition of digital concepts becomes inevitable for students who will live and work in the digital world (Ayonmike, 2014). The technological growth and globalization have resulted in a big gap between teaching methods at schools and ways students are getting information outside school through contact with computers and mobile phones. Currently, the Digital natives are being taught by immigrants who are, in effect, not of the same language. This makes it imperative for technical teachers to appropriately re-structure the classroom learning environment in a way to incorporate computer-based technology instruction. This demands that teachers in technical colleges would adopt instructional methods that are active, authentic, constructive and collaborative akin to the Digital natives that could improve the academic achievement of students in auto mechanics technology in technical colleges. It is expected at this juncture that application of CIA by teachers in technical colleges could enhance the learning outcome of learners as well as improve their psychomotor achievement in auto-mechanics trade in technical colleges in Nigeria. The need to bridge this gap in knowledge of teaching prompted the researchers' curiosity to investigate the effects of CAI on students' psychomotor achievement in auto-mechanics technology in technical colleges.

### PURPOSE OF THE STUDY

- The study specifically, determined the:
- ✓ Mean psychomotor achievement scores of students taught auto-mechanics with CAI and those taught with L/DTM.
  - ✓ Mean psychomotor achievement of scores of high and low achieving students taught auto-mechanics using CAI.

- ✓ Mean psychomotor achievement scores of male and female students taught auto-mechanics using CAI

#### RESEARCH QUESTIONS

The following research questions guided the study:

- ✓ What are the mean psychomotor achievement scores of students taught auto-mechanics using CAI and those taught using L/DTM?
- ✓ What are the mean of psychomotor achievement of scores of high and low-achieving students taught auto-mechanics trade using CAI?
- ✓ What are the mean psychomotor achievement scores of male and female students taught auto-mechanics trade using CAI?

#### HYPOTHESES

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

- ✓ There is no significant difference between the pre-test and post-test mean psychomotor achievement of scores of low and high achieving students taught auto-mechanics with CAI in technical colleges.
- ✓ There is no significant difference between the mean psychomotor achievement scores of low and high-achieving students taught auto-mechanics using CAI in technical college.

#### SIGNIFICANCE OF THE STUDY

The findings of the study would be immense benefits to the following groups: students, teachers, curriculum planners, future researchers, Education Policy makers, society and parents.

The findings of the study would be of immense benefits to students, in the sense that the knowledge provided in the study would enhance their academic performance, arouse interest and address problem of retention outcome. Additionally, the findings of the study would impact positively to students/graduates in the sense that they would acquire skills/competencies, relevant knowledge through their active participation in the lesson using CAI.

Similarly, the awareness of the findings of the study would enable technical teachers to properly package and deliver their lessons using the lesson plan and treatment procedure provided in the study. This would guide them to effectively and efficiently utilize CAI in teaching auto-mechanics. This would make them more resourceful, and avail them the opportunity to develop innovative ingenuity, reflective competence and self-confidence in discharging their responsibilities in a conducive learning environment.

The knowledge garnered in this work would enable curriculum planners and technical and vocational education stakeholders such as NBTE recommend effective methods of teaching auto-mechanics in technical colleges as well as aptly integrate CAI into the curriculum accordingly.

The findings of the study would have substantial benefit to the future researchers in the sense that it would provide empirical data for future research/investigations in related or

allied professions; which could as well contribute significantly to their knowledge particularly in auto-mechanics trade.

The knowledge of the findings of the study, would greatly aid the Ministry of Education in the procurement of ICT equipment for effective teaching and learning in technical colleges, and also come up modalities to improve teachers/students' basic knowledge and skills in auto-maintenance, servicing and repairs.

It is expected that if these recommendations are properly applied, technical colleges would produce competent, skilled and employable auto-mechanics/technicians who would be able to manage automobile industries. This would appreciably boost the technological advancement of the nation, and consequently, reduce the rate of crime in the society. Finally, the awareness of the findings would better the attitudes of parents towards technical and vocational education, thereby, spur them to encourage their children and wards to seek career in auto-mechanics as this would not only heighten their employment opportunity but also improve their standard of living.

#### III. METHODOLOGY

Quasi-experimental design was adopted for the study. Specifically, the pretest, posttest non-randomized control group design was adopted for the study. The design was adopted because it was not possible for the researchers to randomly sample the subject and assign them to groups without disrupting the academic programme and the time table of the technical colleges involved in the study. The study was conducted in technical colleges in Delta State which is located in the south-south zone of Nigeria. The population of the study was 128 year one National Technical Certificate (NTC1) students. A sample size of 101 students was drawn from the four schools. Purposive sampling technique was based on availability of professionally qualified staff, computer facilities for teaching, regular electricity supply and willingness of regular teachers to participation as research assistance.

One intact class was used in each of the four schools giving a total of four intact classes. Simple random sampling was used to assign two intact classes to experimental groups and the other two intact classes to control groups. The groups for the study were coded group A and group B comprising one experimental class and one control class each. Experimental class (Group A) consisted of 37 students and control class (Group A) consisted of 39 students. Experimental class (Group B) consisted of 12 students and control class (Group B) consisted of 13 students.

The instruments for data collection were Auto-Mechanics Achievement Test (AMPAT) adapted by the researcher from the NABTEB past examination questions between 2014 and 2017. AMAT contained 50 multiple choice test items with four options (A-D). The instrument was face and content validated by three experts; two in technical education and one in measurement and evaluation. The reliability of the instrument was established using test-retest method. Copies were administered twice to 15 NTC I auto-mechanics trade students drawn from government science and technical college

Benin City, Edo State who were not part of the population. Reliability estimate method of test retest reliability using manual computation with the Pearson Product Moment correlation between the two sets of scores yielded a correlation coefficient value of 0.81.

The researchers sought and obtained permission from the authorities concerned for the involvement of their colleges and teachers in the study. The study lasted for eight weeks (1<sup>st</sup> week for the pre-test, 2<sup>nd</sup> -5<sup>th</sup> weeks for the study, 6<sup>th</sup> week for the posttest and 8<sup>th</sup> week delayed post-test. The researchers briefed the research assistants (regular classroom teachers) on the techniques to be used before the commencement of experiment. The research assistants were also trained on how to conduct the experiment treatment and were given prepared lesson plans. Pre-test was administered to the two experimental groups after which the actual teaching commenced on the second week. The primary focus of the teaching process was concentrated on automobile workshop, auto-maintenance, servicing/repairs, vehicle layout/chassis types, engine component /functions, single and multi-cylinder engines, four-stroke engines and valve operations. Each lesson lasted for 80 minutes and the treatment lasted for five weeks. At the end of the treatment, a post-test was administered on both groups using the AMAT after one week interval, delay test post-test was administered to both groups to certain their retention level. Data collected were analyzed using mean scores and standard deviation to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. Result of the pre-test and post-test were used for data analyses. Analysis was done using Statistical Package for the Social Sciences (SPSS)

#### IV. RESULTS

Without prejudice to APA Style, we thought the table title should be on top as we earlier presented.

Groups	N	Pre-test mean	SD	Post-test mean	SD	Mean diff.
Experimental	49	24.69	2.49	35.53	3.22	11.04
Control	52	23.84	2.91	33.33	2.99	9.49

Table 1: Pre-test and Post-test Mean Psychomotor Achievement Scores of Students taught Auto-Mechanics trade using CAI and those taught using L/DTM

Table 1 showed that the experimental group had pre-test mean score 24.69 with SD 2.49 and post-test mean score 35.53 with the SD 3.22 and mean difference 11.04; while the control group got the pre-test mean score 23.84 with the SD 2.91 and the post-test mean score 33.33 with the SD 2.99 and mean difference 9.49.

Groups	N	Pre-test mean	SD	Post-test mean	SD	Mean diff.
High Achievers	25	25.55	2.49	35.52	2.37	9.97
Lower Achievers	24	24.14	2.71	33.39	2.55	9.25

Table 2: Mean Psychomotor Achievement Scores of High and Low Achieving Students taught Auto-mechanics using CAI

Table 2 indicates that high-achievers had pre-test mean score 25.55 with SD 2.49 and post-test mean score 35.52 with the SD 2.37 and mean difference 9.97; while the control group got the pre-test mean score 24.14 with the SD 2.71 and the

post-test mean score 33.39 with the SD 2.55 and mean difference 9.25.

Groups	N	Pre-test mean	SD	Post-test mean	SD	Mean diff.
Males	79	27.50	3.34	35.32	1.66	7.82
Females	22	29.20	3.06	34.68	1.63	5.48

Table 3: Mean Pre-test and Post-test Mean Psychomotor Achievement Scores of Male and Female Students Taught Auto-mechanics Using CAI

Table 3 reveals that male students had pre-test mean score 27.50 with SD 3.34 and post-test mean score 35.32 with the SD 1.66 and mean difference 7.82; while the control group got the pre-test mean score 29.20 with the SD 3.06 and the post-test mean score 34.68 with the SD 1.63 and mean difference 5.48. This indicates that the mean psychomotor achievement scores of male and female students when exposed to experimental condition were in favour of the male counterparts.

Source	Type III Sum of Squares	Df	Mean Square	F	P-value	Remarks
Corrected Model	527.406 <sup>a</sup>	2	263.703	3.829	.025	
Intercept	861.793	1	861.793	12.512	.001	
Pretest achievement	413.802	1	413.802	6.008	.016	
Method Error	89.686	1	89.686	1.302	.000	Significant
Total	6749.762	98	68.875			
Corrected Total	11965.000	101				
Corrected Total	7277.168	100				

a. R Squared = .072 (Adjusted R Squared = .054)

Table 4: Summary of ANCOVA for Differences in Psychomotor Achievement of Technical College Students in Auto-mechanics

Table 4 shows that there is a significant main effect of treatment in the posttest achievement of students in the experimental and control groups ( $F(1, 100) = 1.302, p < 0.05$ ). This implies that there was a significant difference in the mean achievement scores of students in experimental and control group. Therefore, the hypothesis that there is no significant mean difference in the achievement of technical college students taught auto-mechanics with CAI and those with lecture/demonstration teaching method was rejected.

Source	Type III Sum of Squares	Df	Mean Square	F	P-value	Remarks
Corrected Model	470.062 <sup>a</sup>	2	235.031	3.384	.038	
Intercept	719.144	1	719.144	10.353	.002	
Pretest achievement	155.618	1	155.618	2.240	.138	
Achievers	32.342	1	32.342	466	.497	Not Significant
Error	6807.107	98	69.460			
Total	11965.000	101				
Corrected Total	7277.168	100				

a. R Squared = .065 (Adjusted R Squared = .046)

Table 5: ANCOVA Summary of Differences in Mean Psychomotor Achievement scores of High and Low Achieving Students taught in Auto-mechanic Trade with CAI

Table 5 shows that the posttest mean psychomotor achievement of high and low achieving students in the

experimental and control groups  $F(1, 100) = 0.497, p > 0.05$ . This means that there was no significant difference in the mean achievement scores of high-achievers and low-achievers in the experimental group. Therefore, the null hypothesis was rejected.

## V. DISCUSSION

Findings of the study revealed that the cognitive achievement mean score of students taught auto-mechanics using it should be CAI is higher than their counterparts in control group who were taught with L/DMT. The findings concurs with the assertion of Nwosu (2009) which reported that experimental group taught with CAI performed better than those in control group who were taught with L/DTM. Based on the foregoing submission, it could be deduced that application of CAI in teaching auto-mechanics could enable students achieve better results in exams. This substantiates the outcome of the hypothesis testing that revealed that there was a significant effect.

The study indicated that the mean difference achievement scores of male and female students exposed to experimental condition was in favour of the male students. The findings disagreed with the findings of Chukwu (2017) that female students performed significantly better than their male counterpart in cognitive achievement mean scores.

The study also showed that high-achievers taught auto-mechanics using CIA had a slightly higher mean difference score than the low-achievers in the same group. The findings validated the submissions of Ahassan (2012) and Bichi (2011) which maintained that high-achievers and low-achievers in the experimental group achieved better than their counterparts in the control group. This indicates the CIA could be very effective in teaching auto-mechanics and related subjects in technical colleges. This was substantiated by the hypothesis result which showed that there was no significant difference between the mean achievement scores of high-achievers and low-achievers taught auto-mechanics using CIA.

## VI. CONCLUSION

Since the findings revealed an appreciable improvement in the performance of students taught auto-mechanics using computer-assisted gadgets as well as the comparison between the achievement of high and low-achievers and male and female students alike. It could therefore be concluded that CAI is not only an innovative teaching method, but could also enable teachers effectively deliver their lessons to enable students assimilate the instruction in order to improve their psychomotor achievement in auto-mechanics in technical colleges.

## VII. RECOMMENDATIONS

Based on the findings of this study, the following recommendations were made:

- ✓ Teachers should be encouraged to use CAI and modern technologies when delivering their instructions to enable learners understand and master what was taught in order to improve their academic achievement in both internal and external examinations.
- ✓ Curriculum planners should in collaboration with relevant stakeholders and technical educators configure the school curricula in order to facilitate the inclusion and effective use of ICT gadgets and tools by technical teachers in order to successfully accomplish the set out learning objectives.
- ✓ Government should provide in-service training cum workshops for professional development of teachers in the application of modern technologies, particularly on the production and use of computerized instructional materials so as to effectively impart in learners requisite skills of today's job needs.
- ✓ Government should equip schools with computers, internet facilities and other necessary instructional tools like slide, video presentations simulator, demonstrator and auto-scan tools. This would facilitate the impartation of expected stimuli or requisite skills in learners.

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