

# Effect of Computer Assisted Instruction (CAI) on Engine Servicing Students Achievement and Interest in Automobile Technology

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**Abstract:** The automobile technology educational achievements of students in internal and external examinations have been a source of concern to Automobile engineers and technologists in this course of study. To overview this, various efforts have been put in place by them. CAI is used in the teaching and learning of Automobile education engine servicing in some Government and private secondary schools in Ogba/Egbema/Ndoni local government area of Rivers state. The study used the quasi-experimental design and consisted of all the senior secondary schools one of the Government and private secondary schools in Rivers state. Instruments used for the study were titled Automobile Technology Achievement Test (ATAT) and Automobile Technology Interest Inventory (ATII) respectively). Research questions asked were answered using means and standard deviation; hypotheses formulated were tested using Analysis of Covariance (ANCOVA) at a .05 level of significance. The study revealed that students who were taught automobiles technology with CAI improved their automobile engine servicing achievement significantly. Students' interest in the automobile technology engine servicing taught during this study improved and was statistically significant. The major recommendation is that Automobile education technology teachers should improve their knowledge and skills in the use of CAI for effective teaching and learning of Automobile engine servicing technology in secondary schools.

**Keywords:** Computer Instruction, Achievement, Interest, Automobile Technology

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## 1. Introduction

Automobile has been identified as the widest industry in the whole world that encourages skills development and depends on Science and Technology (ST). Technology which is regarded to be the backbone of automobile has inspired Technology educators and other stakeholders in science and technology to research the promotion of the teaching and learning of Automobiles in schools. This is more precarious as learners exhibit a lot of apathy towards the subject [1].

The teaching and learning of the Automobile engine serving Technology in Nigeria have been an issue of consideration in research, particularly within the technical education community. Despite these efforts, not much could be said to have been achieved going by the report of student's poor performances at the West African Examination Council

[2]. In the report of Usman and Memeh [3], Nigerian secondary school students' achievement in the ordinary level automobile examinations has been considered poor. On the basis of investigating the poor performance of the student, Nigerian Educational Research and Development Council (NERDC) in 2018 research on the achievement of students in public examinations confirmed students' poor achievement in sciences (mathematics, physics and chemistry) which form the foundation of the future in much of the technology needed in Nigeria. Agwagah [1] opines that students' performance in automobile examinations, both internal and external, from year to year, had never been encouraging. According to Eze [4], despite the urgent need for a good output in the performance of students in Technology, the reverse is the case as students' performance continues to deteriorate yearly. From the foregoing, it implies that more

efforts have to be put in place in order to improve upon the teaching and learning of this important subject.

Research reports have offered several reasons for students' low achievement in automobile engine servicing Technology. Some of these reasons include lack of qualified automobile Technology teachers [5], students' lack of interest and/or negative attitude towards automobile engine servicing technology [6], teachers' negative attitude and/or incompetence in certain concepts [7], as well as a poor method of teaching applied by teachers in automobile engine servicing technology classroom [8], Slimmons revealed that instructional strategies employed by the teachers affect the cognitive, affective and psychomotor outcomes of the learner.

WAEC's annual reports (2016-2018) attributed students' poor automobile performance to poor teaching methods that resulted in the weak preparation of candidates for the examination. In this vein, Habor- Peter [9] asserts the issue of poor performance in automobile examination was due to the problem of methods. The annual reports of WAEC (2016-2018) had earlier recommended good teaching and good preparation of candidates as the only remedy to students' poor performance in automobile engine servicing technology in Senior Secondary Certificate Examination (SSCE). This spurs automobile educators to focus their searchlight on teaching to improve learners' achievement in various automobile engine servicing technology concepts as identified by experts.

Diverse instructional methods have been used by Automobile engine servicing technology concepts. The essence of conceptual focus in automobile engine servicing technology could be narrowed down. Different methods of teaching among which is the usage of computers were employed in the Automobile engine servicing technology classroom. Iji and Habor- Peter [10] observed that the introduction of computers into the Automobile engine servicing technology classroom is widely seen as a catalyst for change in student-teacher relations, with students more likely to make the decision. The implication here is to evolve a new pedagogy in automobile engine servicing technology education in Rivers State, especially now that the complexity of the modern society is increasing the demand for better education. In this modern-day and age, computers are being used in every sphere of human endeavour. Most classrooms now have at least one computer.

Technology teachers who have access to computers in their classrooms try to sometimes incorporate computer usage in their lessons. In a narrower term, CAI is most often referred to as drill-and-practice, tutorial or simulation activities offered either by themselves or as supplements to traditional, teacher-directed instruction [8]. This paper used CAI to teach automobile engine servicing technology in secondary school. As increase use of technology and the empirical sciences spread throughout the global community, the use of data and graphs to communicate information is ever increasing. Daily decision making and discussions of social issues are increasingly influenced by automobile engine servicing technology and projected outcomes based on estimated

probabilities. Unfortunately, most of our school graduates have little or no background in the automobile technology associated with calculating automobile probabilities and interpreting automobile statistics. Iwunor [11] opines that Technology must always be a means to an end and not an end in itself. The need of the knowledge and skills of Technology to enable students to master the vocabulary of automobile engine servicing technology, acquire skills of computation, learn to interpret Technology results correctly, grasp the logic of automobile engine servicing technology; learn where to apply statistics and where not to as well as understand the underlying automobile technology in terms of practice will enhance students interest [12].

The adoption of CAI both internationally and locally by experts as a method of teaching and learning of some concepts in automobile engine servicing technology have been elaborately conducted. The Technology performance of third graders using a commercial computerized drill and practice program with that of similar students using a conventional print drill program were compared and there were no statistically significant differences between groups [12, 13]. Research on the comparison of the effects of CAI and traditional instruction on automobile achievement and attitude of students toward school automobiles was conducted by Dalton & Hannafin [14]. Their findings depict a higher performance of students with a greater positive attitude towards the use of CAI [15]. Students performed significantly higher with automobile posttests CAI than traditional instruction on Canadian third and fifth graders [16]. Other significant applications of CAI were graphing skills [17], automobile improved achievement test in calculus [18], logo programming method for junior secondary one geometry [10] and quadratic expressions at the secondary school [19]. On the other hand, the constructivist model for teaching probability concepts and ethno mathematic approach on students' interest in geometry and mensuration were estimated statistically significant on the performance and self-concept in secondary school automobiles [20, 21]. However, available literature suggested that the researches on the use of this method in the teaching and learning of automobile engine servicing technology in the senior secondary are scarce or none existence in Rivers State.

### ***1.1. Statement of the Problem***

It has been discovered over the years that there exists the problem of students' low achievement in automobile Technology examinations. This problem has, therefore, generated great concern among parents, the public, automobile Technology educators and other stakeholders. Due to this, automobile Technology educators have been looking for ways of reducing this problem of low achievement and dwindling interest of students in the subject. Among such ways is the introduction of new methods of teaching the subject with a focus on various automobile engine servicing technology concepts. Different methods have been introduced by Technology educators one of which is the use of CAI. However, it appears that the use of CAI as

a method in the teaching of automobile engine servicing technology will improve students' achievement? Will its use also enhance students' interest in the learning of the subject? These questions necessitated this study.

### 1.2. Purpose of the Study

The purpose of the study was to ascertain the efficacy of the use of CAI as a means of improving senior secondary students' achievement and interest in *automobile* engine servicing technology. Specifically, it determined whether;

1. Students taught *automobile* engine servicing technology using CAI achieve better than those taught with the conventional method.
2. Students taught *automobile* engine servicing technology using CAI improve their automobile interest better than those taught using the conventional method.

### 1.3. Research Questions

The following research questions were asked to give the study a focus.

1. What are the mean achievement scores of students taught *automobile* engine servicing technology using CAI and those taught *automobile* engine servicing technology using the conventional method?
2. What are the mean interest scores of students taught *automobile* engine servicing technology using CAI and those taught *automobile* engine servicing technology using conventional methods?

### 1.4. Hypotheses

The following hypotheses were formulated and tested at a 0.05 level of significance.

1. There is no significant difference between the mean achievement scores of students taught *automobile* engine servicing technology using CAI and those taught *automobile* engine servicing technology using the conventional method.
2. There is no significant difference between the mean interest scores of students taught *automobile* engine servicing technology using CAI and those taught *automobile* engine servicing technology using the conventional method.

## 2. Method

The study used a quasi-experimental design. This was based on the fact that it is not easy to carry out true experiments in education. It was carried out in Rivers State. The population of the study consisted of all the senior secondary school students of Government secondary school in Rivers State. This was purposively chosen since the school is centrally located as well as has and uses computers for teaching activities. Again, senior secondary one class was chosen for the study because an *automobile* technology is spelt out in the curriculum at this stage and it is better to start from students' early stage of encounter with this concept.

Two streams of the class selected were used for the study. An intact class was used. The experimental and control groups were made up of 40 students each. The essence of intact classes was to avoid interferences and the distraction of normal activities in the classroom. A total of 80 students were used. Senior secondary ones A and B were used for the experimental and control group respectively. Instruments of study are *Automobile Technology* Achievement Test (ATAT) and *Automobile Technology* Interest Inventory (ATII). They were validated by two experts one in the automobile technology department and the other in measurement and evaluation. Data collected with the instrument were analysed by the research questions and hypotheses formulated for this study. Research questions were answered using descriptive statistics of Mean and standard Deviation while Analysis of Covariance (ANCOVA) was used to test the hypotheses at .05 level of significance.

In carrying out this study, a stream of the chosen class was randomly assigned experimental and control groups. This was done by the use of a throw of a coin with the head being assigned experimental group and the tail control group. The regular automobile teacher taught the control group while the researcher introduced as a newly posted automobile technology taught the experimental group using CAI. The classes were already intact. After the assignment, a pre-test was administered to the students before the commencement of the treatment. The actual teaching started a day after the administration of the pre-test. Students in both experimental, and control group were taught the same topics (major engine serving components, charging system, wheel Alignment, auto body as well as vulcanizing system) within the same length of time. Each group was taught for three weeks of four periods of 40 minutes each per week. In all, 10 lessons were taught during the period of the study. The same instrument was used for both pre-test and post-test. However, the post-test was disguised by reshuffling items in the instrument of study.

## 3. Results

### Research question 1

What are the mean achievement scores of students taught automobile engine servicing technology using CAI and those taught automobile engine servicing technology using the conventional method? The answer to this question is presented in Table 1.

Table 1 shows that the experimental group had a mean score of 22.93 with a standard deviation of 8.02 in the pre-test and a mean score of 7.98 in the post-test. While the control group had a mean score of 21.18 with a standard deviation of 8.72 in the pre-test and a mean of 44.50 with a standard deviation of 10.25 in the post-test. The mean difference for the Experimental and Control groups are 51.30 and 43.43 respectively and a mean gain of 7.87 as a result of the treatment [10]. This indicates that there exists a positive difference in students' automobile achievement in favour of those taught using CAI From the finding of this study, it

could be seen that students' mean automobile engine servicing technology scores improved. This improvement in an Automobile engine servicing technology achievement is due to the usage of CAI during this study. This outcome appears to agree with Hawley *et al.*, [16]; Mokros and Tinker [17]; Mathew [18]; Iji and Harbor-Peters [10]. and Etukudo and Utin [19] who all found the use of CAI to make a significant improvement in students' automobile

achievement. Specifically, Matthew, Iji and Harbor-Peters as well as Etukudo and Utin found it significant in major engine components, charging systems and auto body respectively. However, the improvement noted by these studies might not be unconnected with the present wide use and availability of handsets to the majority of the subjects of this study. This may be because the operations of handsets are not very much different from that of a computer.

**Table 1.** Mean achievement scores, standard deviation, mean difference and mean gain of experimental and control groups.

Groups	N	Mean		Standard deviation		Mean Difference	Mean Gain
		Pre-test	Post-test	Pre-test	Post-test		
Experimental Groups	40	22.93	56.75	8.02	7.98	51.30	7.87
Control Group	40	21.18	44.50	8.72	10.25	43.43	
TOTAL	80						

### Research Question 2

What are the mean interest scores of students taught automobile engine servicing technology using CAI and that taught automobile engine servicing technology using conventional methods?

**Table 2.** Mean interest and standard deviation of male and female students taught automobile engine servicing technology with CAI.

Groups	N	Mean		Standard deviation	
		Pre-test	Post-test	Pre-test	Post-test
Male Experimental)	45	38.56	66.59	14.09	17.07
Female (Experimental)	35	31.04	59.19	13.41	15.55
TOTAL	80				

From the results presented on table 2 above, male students in experiment group had a pre-test mean interest score and standard deviation of 38.56 and 14.09 respectively, while their post - test mean interest score and standard deviation were 66.59 and 17.07 respectively. female students in experimental group had pre-test mean interest score and standard deviation of 31.04 and 13.41 respectively, while their post-test mean interest score and standard deviation 59.19 and 15.55 respectively. the result shows that male students recorded higher interest than their female counterparts when taught automobile engine servicing technology with CAI. These result corroborate the reports of Etukudo & Utin [19].

This outcome appears to agree with students' automobile interest. Specifically, Matthew, Iji and Harbor-Peters as well as Etukudo and Utin [19] found it significant in major engine charging systems and auto body respectively. However, the improvement noted by these studies might not be unconnected with the present wide use and availability of handsets to the majority of the subjects of this study. This may be because the interest in the operations of modern

devices are very much different from that of a computer.

Again, the finding that students' interest in automobiles improved during the period of this study may not be surprising. This is because whatever captivates an individual will propel his/her interest. This finding tends to be in line with those of Dalton and Hannafin [14], Mevarech and Rich [15] as well as Kurumeh [21] who all found that student's interest significantly improved due to the adoption of appropriate teaching methods in the teaching of automobile concepts. This finding also brings to the limelight the importance of automobiles as stated by Iwunor [11] with view that the automobile must always be a means to an end and not an end in itself.

### Research Hypothesis 1

There is no significant difference between the mean achievement scores of students taught automobile engine servicing technology using CAI and those taught automobile engines servicing technology using the conventional method.

The result of the test of this hypothesis is presented in Table 3.

**Table 3.** Analysis of Covariate of students' post Achievement scores due to the use of CAI.

Sources Variance	Sum of Square	df	Mean Square	F-cal	F-crit
Covariate	87.754	1	87.754	5.696	
Main Effects	868.527	2	289.509	89.93	1
Method & Achievement	852.020	1	332.508	99.030	3.96
Explained	893.145	3	148.024	86.644	
Residual	6671.032	76	89.334		
Total	6775.4232 79	98	.025		

Table 3 indicates that the F-cal of Main Effect is 89.931 while that of Method versus Achievement is 99.030. All

these are greater than the table value of 3.96. This implies that the null hypothesis of no significant difference is

rejected. The result of hypothesis one revealed that there is a significant positive achievement in the scores of students taught automobile engine servicing technology using CAI and those taught automobile engines servicing technology using the conventional method and the finding of this hypothesis is in line with the view of Dalton & Hannafin [14]. Who opined that a higher performance of students with a greater positive attitude towards the use of CAI is a function of the method involved [15]. Students performed significantly higher with automobile posttests CAI than traditional instruction [16]. Also the hypothesis is in line with [14] who noted the significant applications of CAI were graphing skills [17], automobile improved achievement test in calculus [18], logo programming method for junior

secondary one geometry [10] and quadratic expressions at the secondary school [19]. On the other hand, the constructivist model for teaching probability concepts and ethno mathematic approach on students' interest in geometry and mensuration were estimated statistically significant on the performance and self-concept in secondary school automobiles [20, 21].

#### Research Hypothesis 2

There is no significant difference between the mean interest scores of students taught Automobile engine servicing technology using CAI and those taught automobile engine servicing technology using the conventional method. The result of the test of this hypothesis is presented in Table 4.

**Table 4.** Analysis of Covariance of students' Post interest scores due to the use of CAI.

Sources Variance	Sum of Square	df	Mean Square	F-cal	F-crit
Covariate	24.754	1	24.754	0.313	
Main Effects	195.503	2	110.231	5.231	3.96
Method & interest	235.423	1	185.373	6.373	
Explained	896.492	3	265.082	4.268	
Residual	6671.032	76	89.334		
Total	4235.789 79	80.	425		

Table 4 shows that F-cal for Main Effect is 5.231 while that of Method Values are all greater than the critical value of 3.96. This finding, therefore, implies that the null hypothesis of no significant difference is rejected. The result of hypothesis two indicate that there is a significant difference between the interest of male and that of female because automobile engine servicing technology scores improved. This improvement in an Automobile engine servicing technology achievement interest due to the usage of CAI during this study. This outcome appears to agree with Hawley *et al.*, [16]; Mokros and Tinker [17]; Mathew [18]; Iji and Harbor-Peters [10]. and Etukudo and Utin [19] Agwagah, [22]. who all found the use of CAI to make a significant improvement in students' automobile achievement. Specifically, Matthew, Iji and Harbor-Peters as well as Etukudo and Utin found it significant in major engine components, charging systems and auto body respectively. However, the improvement noted by these studies might not be unconnected with the present wide use and availability of handsets to the majority of the subjects of this study. This may be because the operations of handsets are not very much different from that of a computer. Again, the finding that students' interest in automobiles improved during the period of this study may not be surprising. This is because whatever captivates an individual will propel his/her interest. This finding tends to be in line with those of Dalton and Hannafin [14], Mevarech and Rich [15] as well as Kurumeh [21] who all found that student's interest significantly improved due to the adoption of appropriate teaching methods in the teaching of automobile concepts. This finding also brings to the limelight the importance of automobiles as stated by Iwunor [11] with view that the automobile must always be

a means to an end and not an end in itself.

## 4. Conclusion

This study was born out of the enormous importance of Automobile and their attendant neglect at the secondary school level in our school system. Also for the various problems of poor students' achievement in Automobile. The findings show that students' achievement and interest significantly improved due to the usage of CAI in teaching automobile engine servicing technology. Servicing technology using CAI have a higher mean score than their counterpart in the conventional method. Students improved upon their automobile achievement. More interesting is that this achievement is relatively close as it could be seen from the standard deviation scores. There is equally an improvement of interest of students in the automobile engine servicing technology taught during this study. Moreover, this was shown to be statistically significant. Also Computer-Assisted Instruction should be incorporated into the automobile classroom by stakeholders. Since the automobile is particularly important in helping students face critical challenges of life, the government should do more than it is doing by providing enough computers in public schools for teaching and learning automobiles in secondary schools. Automobile teachers must improve their knowledge and skills in the use of CAI in the teaching of this subject.

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