



# Effect of Petrol Engine Model on Academic Achievement and Interest of Motor Vehicle Mechanics Students in Technical Colleges in Borno State

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**Abstract:** This study examined the effect of constructed petrol engine model on academic achievement and interest of motor vehicle mechanics students in technical colleges in Borno State. The study had three objectives, three research questions and two null hypotheses. The study used quasi-experimental research design. The population of the study was 58 technical college students (Auto-mechanics students). The instrument used for data collection were motor vehicle mechanics achievement test (MVMAT) and motor vehicle mechanics interest inventory (MVMII). Research questions were analyzed using mean and standard deviation while the null hypotheses were tested at 0.05 level of significance using Analysis of Covariance (ANCOVA). Based on the data analyzed the study revealed that motor vehicle mechanics interest inventory before treatment were undecided while motor vehicle mechanics interest inventory after treatment was high and constructed petrol engine model has positive effect on the achievement of motor vehicle mechanics students in technical colleges and the interaction of treatment and gender has no effect on the achievement of motor vehicle mechanics students in technical colleges. The researcher recommended that the constructed petrol engine model should be used in teaching and learning of petrol engine lesson in technical college in Borno State; and government should encourage the funding of construction of petrol model for the purpose of enhancing teaching and learning of motor vehicle mechanic course in technical colleges.

**Key words:** Engine model, Students academic achievement, Experiment, Teaching, Interest.

## Introduction

Models can be used to enhance learning especially where real objects may not serve the purpose. It shows the actual representation of the original. According to Macdonal (1991) a model is a plan, a design, a preliminary solid representation to be followed in construction, something to be copied. Nachimias and Nachimias (1992) sees model as a likeness of something and a representation of reality.

Models can be used to make teaching and learning of automobile technology. Motor vehicle mechanics work is one of the trades offered in technical colleges (Federal Republic of Nigeria, 2013). According to Schaller (2000), motor vehicle mechanics work is the learning of basic knowledge and skills necessary to diagnose and repair mechanical defects in automobiles. A model can be constructed and used in teaching some specific automobile engine parts such as crankshaft, piston, cylinder block, cylinder head, connecting rods, push

rods, plugs, valves and crankshaft. It is simpler in construction, easy to carry and move about because it is not heavy as in the case of a real auto-engine.

Jimoh (2010) observed that students' achievement connotes performance in school subjects as symbolized by a score on an achievement test. Ogwo and Oranu (2006) laid emphasis on the need for teachers to use stimulating strategies which lead to better retention of subject matter without which students' achievement will be minimal. Interest is a persisting tendency to pay attention and enjoy some activities (Jimoh, 2010). However, it is pertinent that auto-mechanics teachers should use teaching strategy which ensures gender active involvement in learning and provide suitable learning environment to improve achievement and retention of automobile students in technical colleges.

Federal Ministry of Education (2004) in her report on Technical Colleges revealed that students in Technical Colleges are always put-off or not interested in vocational education (auto-mechanics inclusive) because of motivating and unchallenging strategy and approach used by their instructors and teachers. If the teaching strategy is fascinating, students would not have difficulty in retention of the subject matter. Therefore, in other to make the students retain and reproduce what is being taught in motor vehicle mechanic class, model is required arouse their interest.

Report by researchers revealed that the teaching and learning of auto mechanics nowadays in the Technical Colleges is still bedeviled by a mirage of problems ranging from over-population, change of teacher's role, lack of staff and equipment, inadequate skilled and competent professionals that can assist students in learning and acquiring skills that would make them proficient in their automobile career (Aloraini, 2005 and Osho, 2007).

An appropriate strategy for teaching automobile subject may foster interest and academic achievements of auto-mechanics students in technical colleges. Paden and Dereshiwsky (2007) and Omenka (2010) attributed the low achievement and interest rate in technical students to conventional teaching method mainly adopted by teachers. The conventional methods of teaching which are teachers centered that is persistently used for years is now gaining poorer results when compared with the modern and revolutionary teaching methods (Jackson, 2012). According to Mbah (2002), achievement is dependent upon several factors amongst which are instructional techniques, the learning environment, motivation as well as retention. Hence, the academic achievement of students in automobile also depends on the interest capability of the students in the subject. Agaba (2013) also confirmed that achievement in education is directly connected to knowledge retain.

Most automobile technology teachers in the technical colleges do constantly face the decision of how to design instruction, which will best meet the needs of the students. The decisions include selecting the best strategy that would be appropriate for teaching and learning (Amen, 2007). Agnew and Shinn (1990) are of the opinion that the selection process requires not only the teacher being aware of how to use various techniques, but that he or she knows which type of students learn best with various techniques. Due to the present advancement in technology and sophistication in automobile technology, the traditional teaching methods adopted by most teachers in teaching automobile in technical colleges do not allow teachers to adequately cater for the diverse learning styles of most students (Neekpoa, 2007). As technology is changing, the auto-technicians must change with the

technology so that the level of their thinking in dealings with various diagnoses, repairs, and maintenance of motor vehicles should be commensurate with maintenance need of today's automobile. In other words, students need to be equipped with higher order thinking skills for easy adaptability. Campbell and Campbell (1999) stated that traditional teaching methods do not adequately equip teachers with contemporary views of student intelligences and their vast learning capabilities. The consequence of this, according to Roegge, Wentling and Bragg (2000), is that students are unable to retain learning and to apply it to new situation.

The National Business and Technical Education Board (NABTEB) May/June Chief examiner's report (NABTEB, 2002) indicated that the shortcomings of the present teaching method partly accounted for the poor performance of students in auto-mechanics technology in the National Technical Certificate Examination in recent years. According to NABTEB (2006) the performance of students in National Technical Certificate (NTC) Examination was poor. The report showed that the level of achievement in auto-mechanics subjects was lower than expectation as most students scored less than 50 percent in this subject. This low achievement may be due to the traditional system of teaching adopted by automobile teachers in the technical colleges while teaching petrol engine in the classroom.

The vestiges of the traditional system of teaching and evaluation still prevail in schools (Sofolahan, 1991). He further maintained that when traditional method of teaching is employed, students' ability to grasp relevant concepts is made much more difficult than when students are exposed to lessons involving hands-on experience. Supporting Sofolahan, Haruna (1992) and Okebukola (1997) noted that in spite of the numerous teaching strategies propounded to cope with the recent trend in the various curriculum structures for schools, evidence had continued to show that most teachers still adopt the traditional talk chalk approach. The traditional instructional method of teaching has its advantages and disadvantages and the recurrent poor academic achievement in automobile technology subject may be related to the use of conventional/traditional method of teaching as observed by Ezeh (2006).

However, the best way to make learning more concrete is to make use of real objects and in some situations, real object may either be too large or complex that hidden details are obscured. This situation arises in the study of some aspects of automobile. For example, how the crankshaft rotates in an engine, the jumping of sparks at the rear end of the spark plug resulting in igniting the mixture of fuel and air in the combustion chamber are hidden details that cannot be seen. Real object as well may be dangerous, and in such situations, the teaching and learning must be brought down to the learners' level using prototype or model so that the students would have a good mental picture of the topic being taught in the classroom. Learning with real objects may sometimes be too costly should any damage occur. Hence, it is better to start from the use of models for teaching/learning activities in the classroom before handling the real object in the workshop. Another commonly stated merit of the use of models is the learning safety as well as practicing new information or skills that may be tedious in real life. Lee (1979) describes safety as a factor to be considered when selecting a strategy.

Therefore, the need to find the best strategy that will assist students in auto-mechanics work and improve their retention and academic achievement has become most important to auto-mechanics teachers in North Eastern Nigeria.

## **Statement of the Problem**

Many Technical College students find it difficult to study automobile technology because they see the engine as a complicated device. Those who eventually study auto-mechanics do not possess expected practical skills. This defeats the objective of self-reliant emphasize in National Policy on Education (FRN, 2013). The shortcoming in these conventional methods of teaching could be accountable for poor achievement of auto mechanics students in public examinations (NABTEB 2012) In the same vein, (Ogbuanya and Owodunni, 2013) opined that the persistent poor academic achievement as well as lack of interest in auto mechanics is as a result of the inappropriate and un-motivating approach and methods adopted by teachers in the classroom. Oluwatumbi (2015) asserted that it is appalling that many students graduate yearly from technical colleges without acquiring relevant practical skills. This situation became worrisome as most students have loss interest and are not willing to further their education in automobile at higher level.

Therefore, in order to address the issue of poor practical skills acquisition, and low performance of auto-students in National Technical Certificate (NTC) examination in Technical Colleges in Borno, a better method should be employ in imparting practical skills which is the use of model in the auto mechanic lesson to enable the students to have an insight of what the vehicle engine entails before the practical work in the workshop. This may likely arouse the students' interest as well as improving their retention and academic achievement. This study therefore, focused on finding out the effects of model on interest and academic achievement of auto mechanics students in technical colleges in Borno State, Nigeria.

## **Purpose of the Study**

The purpose of this study was to determine the effect of models on interest and academic achievement of auto-mechanics students in technical colleges in Borno State Nigeria.

Specifically, this study sought to:

1. Determine the difference in the mean scores of motor vehicle mechanics interest inventory on motor vehicle mechanics students before and after treatment in technical colleges in Borno State
2. Determine the effect of constructed petrol engine model on academic achievement of motor vehicle mechanics students before and after treatment in technical colleges in Borno State.
3. Determine whether there is any interaction effect of sex and experiment on academic achievement of motor vehicle mechanics students in technical colleges in Borno State

## **Research Questions**

The following research questions guide the study:

1. What is mean scores of motor vehicle mechanics interest inventory on motor vehicle mechanics students before and after treatment in technical colleges in Borno State?
2. What is the effect of constructed petrol engine model on academic achievement of motor vehicle mechanics students in technical colleges in Borno State?
3. Is there any interaction effect of gender and experiment on academic achievement of

motor vehicle mechanics students in technical colleges in Borno State

### **Hypotheses**

The following null hypotheses at a level of significance of 0.05 will guide the study:

Ho1. There is no significant effect of constructed petrol engine model on academic achievement

of motor vehicle mechanics students in technical colleges in Borno State.

Ho2. There is no significant interaction effect of treatment and gender on the achievement of motor vehicle mechanics students in technical colleges in Borno State.

### **Significance of the Study**

The findings of this study will sensitize the auto-mechanics teachers on the benefit of the use of models in teaching, since it has greater effect on the interest and academic achievement of the students. The research findings will as well form another dimension of innovations in teaching and learning of automobile.

The curriculum planners would also benefit from this study. The results of the research would assist in curriculum planning. For instance, information relating to the teaching and learning of automobile with the use of models will be utilized in the appropriate stages of curriculum planning, modification and revision.

The finding of this study will be of immense benefit to the students who have been sceptical in studying automobile since the study will be provided with pedagogical information that may improve their learning in petrol engine thereby the student will gain adequate knowledge in the course of training. The research findings will as well increase the interest of the students in auto-mechanics work.

The Ministry of education will also find this study useful. The findings of the study can be utilizing by the Education Ministry by organizing conferences, seminars, and workshops to sensitize and re-train auto-mechanics teachers on the use of models to improve their teaching.

### **Scope of the Study**

Among the various types of models, the research is limited to the experimental construction type of model which is relevant to the study. The petrol engine is taught at National Technical Certificate (NTC) 1 in the first term of the academic year. **Methodology**

### **Research Design**

The research design adopted for the study was the quasi-experimental non-randomize control group design. Quasi-experimental design can be use when it is not possible for the researcher to randomly sample the subject and assign them to treatment groups without disrupting the academic programmes of the schools involved in the study (Borg 2007). The type of quasi experimental design that is to be used is the non-equivalent control group which involves two groups.

The reason to adopt the quasi-experimental design is that intact classes are used by the researcher; quasi-experimental design did not involve randomization of participating units as applied in the true experimental designs. If random selection in true experimental design will be used, the school administration may not allow the splitting of classes, since it will likely disrupt normal school programmes. The quasi- experimental design thus can suit the use of intact classes which easily fit into the normal school programmes as it can smooth the conduct of the experiment.

## **Area of the Study**

The study was conducted in Borno State, Nigeria. Borno State lies within latitude 11°-15°E and longitude 100 and 25°N and is located in the North-Eastern sub-region of Nigeria. The State shares border with Republic of Niger to the North, Chad to the North-East and Cameroon to the East. Within Nigeria, it is bounded by Yobe State to the West, Gombe State to the South-West and Adamawa State to the South. Borno State has 27 Local Government (Borno State Ministry of Information and Home Affairs, 2009).

## **Population for the Study**

The population for the study comprised of 58 NTC 1 motor vehicle mechanics students in Technical College Damboa is the one functional while Technical College Bama has been displaced by insurgence, therefore the population for the study remained 58 NTC 1 motor vehicle mechanics students in Damboa, Borno State.

## **Sample and Sampling Technique**

There was no sampling involved as the population was manageable. The sample size was 58 auto-mechanics students of technical college in Damboa, Borno State.

## **Instruments for Data Collection**

The instruments that were developed by the researcher for the data collection in this study were motor vehicle mechanics achievement test (MVMAT) and motor vehicle mechanics interest inventory (MVMII). The interest inventory which was used to test the students' interest in motor vehicle mechanics test is a-30 multiple choice items and validated by the technical education experts in the Department of Technical Education Ramat Polytechnic Maiduguri to test the students' understanding in the subject and also the Auto-Mechanics Achievement Test (AMAT) is a-30 multiple choice items. Each has four options. The instrument covers the content areas of the topic selected for the study. To ensure the content validity, a table of specification on the instrument which ensured an appropriate distribution of the test items, with respect to the relevant content area chosen as well as the cognitive objective levels desired was applied based on the Bloom's Taxonomy of education objectives. A trial test was conducted on the MVMT for the purpose of determining the psychometric indices of the test. In the trial test, the AMAT was administered to 10 Year, NTC1 students in Technical College Damaturu, Borno State.

A trial test was also conducted on the AMII instrument. The purpose of the trial test was to try out the instrument and receive feedback on the reactions and effects based on the application.

The items will be based on five point Likert scale of strongly Agree (SA), Agree (A), Undecided (UD), Disagree (D) and strongly Disagree (SD). The motor vehicle mechanics work lesson notes that will be used for the study will be developed by the researcher.

## **Validation of the Instruments**

The validation of the instruments takes the form of face and content validation. Two experts carry out the validation of the instruments. In the course of face validation, the experts subjected the items to criticism and vetting with respect to relevance, suitability, repetition, set objectives, use of language and ambiguity as demanded by the researcher. The items were reorganized at the end of the face validation. The Motor Vehicle Mechanics Lesson Note and Motor Vehicle Mechanics Interest inventory will be subjected to face validation by the two

experts from Department of Technical Education Ramat Polytechnic Maiduguri. To ensure the content validity, a table of specification on the instrument which ensured an appropriate distribution of the test items, with respect to the relevant content area chosen as well as the cognitive objective levels desired were applied based on the Bloom's Taxonomy of education objectives. A table of specification was built for the test. Based on the table of specification, items for the Motor Vehicle Mechanics Achievement Test will be developed.

### **Reliability of the Instruments.**

A trial test of the Motor Vehicle Mechanics Achievement Test and Motor Vehicle Mechanics Interest Inventory was carried out using test-retest reliability technique. The instrument was administered on 10 motor mechanic students of Government Technical College, Damaturu, Yobe State. Cronbach Alpha will be used. The Cronbach Alpha was used to establish the reliability. A reliability coefficient of 0.831. The instrument was considered positive and stable.

### **Experimental Conditions**

In order to avoid experimental bias, regular class teachers in the participating technical colleges taught the students. However, the researcher did not be involve directly in the administration of the instrument.

The classroom teachers were involved in administering the instruments and were properly trained by the researcher for the experimental construction petrol engine model before and after treatment in order to ensure the homogeneity of instruction across the groups and detailed explanation was given to the teachers by the researcher prior to the treatment.

The lesson notes were used, the researcher prepared the model and each teacher participated in administering the instrument using the lesson notes prior to the experiment and were supervised by the researcher. All these are aimed at arriving at a standardized mode of presentation among the teachers that were involved in administering the instruments and this assisted in eliminating the teacher variability factor extraneous to the study. The students in the experimental construction petrol engine model before and after treatment were not informed that they were involved in any research process.

### **Experimental Procedure**

The experimental group before treatment was taught without model but used traditional method while experimental group after treatment used model. Interest inventory on motor vehicle mechanics work were administered as well the experimental construction petrol engine model. The same questions were used for experimental group before and after treatment but the questions were re-arranged. The reason for the re-arrangement of the questions so that the students would not be able to discover that the same questions is used to the group before treatment.

### **Method of Data Collection**

The scores that were generated from Motor Vehicle Mechanics Achievement Test (MVMAT) and Motor Vehicle Interest Inventory (MVMII) were used as the data collection for the research work. The researcher and motor vehicle mechanics teachers were involved in the administration and collection of the Motor Vehicle Mechanics Achievement Test and Motor Vehicle Mechanics Interest Inventory.

### Method of Data Analysis

Mean and standard deviation was used to answer the research questions while the analysis of covariance (ANCOVA) was used for testing the hypotheses at a significance level of 0.05. Since the research involved two group before and after treatment of intact classes, the statistical technique adopted for analyzing the hypotheses (ANCOVA) enabled the researcher to adjust initial group differences (Non-equivalence). Using ANCOVA helped to compare the mean of the two groups.

### Decision Rule

Any Group before or after treatment with higher mean value irrespective of the closeness in the mean value of the other group would be taken to have performed better in achievement test or showing much interest in petrol engine. If the significance of F is less than 0.05, the null hypothesis is rejected. If the significance of F is greater than 0.05, the null hypothesis is accepted.

### Analysis of Demographic Data

The demographic data for the study were analyzed in Tables 1 and 2 as follows:

**Table 1: Percentages distribution of students according to the grouping**

<b>Group</b>	<b>Frequency</b>	<b>Percentage (%)</b>
Experimental group one	30	51.7
Control group	28	48.3
<b>Total</b>	<b>58</b>	<b>100.0</b>

Source: Field experiment, 2021

The data presented in Table 1 revealed that there are 30 students representing 51.7% in experimental group (Petrol engine model group), and 28 students representing 48.3% in control group. This implied that there are more students in experimental group than students in control group.

**Table 2: Percentages distribution of students by gender**

<b>Gender</b>	<b>Frequency</b>	<b>Percentage (%)</b>
Male	27	46.6
Female	31	53.4
<b>Total</b>	<b>58</b>	<b>100.0</b>

Source: Field experiment, 2021

Table 2 revealed that there are 27 male students representing 46.6% and 31 female students representing 53.4% used for the experimental study. This indicated that female students used for the experimental study are more in number than male students used for the study.



### Analysis of Quantitative Data on motor vehicle mechanics interest inventory

**Table 3: Mean and standard deviation of responses on motor vehicle mechanics interest inventory before treatment**

S/N	Item Statements	$\bar{X}$	SD	Remark
1.	Motor vehicle mechanics subjects are simple to understand.	4.44	0.75	Agreed
2.	Auto-mechanics class is very interesting.	4.48	0.58	Agreed
3.	Auto-mechanics period is always not interesting.	3.11	1.67	Undecided
4.	I enjoy participating in Auto-mechanics lesson.	4.33	0.78	Agreed
5.	I attended Auto-mechanics class regularly.	4.48	0.58	Agreed
6.	It is better to use auto-mechanics periods for other subjects.	3.26	1.38	Undecided
7.	I dislike auto-mechanics class period because there is no practical activities.	2.78	1.28	Disagreed
8.	I don't use to ask questions during auto-mechanics class.	2.74	1.48	Disagreed
9.	I pay more attention in the auto-mechanics class.	4.22	1.09	Agreed
10.	I don't like discussing about auto-mechanics subjects.	2.56	1.45	Disagreed
11.	I don't like doing assignments on auto-mechanics subjects.	2.30	1.44	Disagreed
12.	I always feel sleepy during auto-mechanics lesson.	1.93	1.00	Strongly Disagreed
13.	If auto-mechanics teacher/instructor fails to come to the class on time, I can go to his office to call him/her.	3.37	1.78	Undecided
14.	If auto-mechanics teacher/instructor misses his auto mechanics class, I always feel happy.	1.56	0.93	Strongly Disagreed
15.	I prefer auto-mechanics option to any other option in vocational trade.	3.59	1.12	Agreed
16.	I take interest in studying engine parts	4.37	0.84	Agreed
17.	Auto-mechanics practical class increases my interest in auto-mechanics trade.	4.59	0.57	Agreed
18.	Auto-mechanics practical lessons involves students in series of activities so that	3.89	1.48	Agreed
19.	I prefer auto-mechanics syllabus that does not require much drawings.	3.89	0.93	Agreed
20.	I prefer auto-mechanics syllabus that does not require much practical work.	2.48	1.37	Disagreed
21.	I take interest in handling automotive faults during practical class.	3.89	1.12	Agreed
22.	I pay much interest in auto-mechanics lessons more than in any other general subjects.	3.44	1.12	Undecided
23.	I don't take interest in anything involving automotive system.	2.26	1.35	Disagreed
24.	Automotive systems increase my interest in auto-mechanics trade.	4.00	1.18	Agreed
25.	I encourage my friends to develop interest in auto-mechanics.	3.81	1.08	Agreed
26.	The strategies adopted in teaching auto-mechanics subjects by the teachers negatively affect my interest in auto-mechanics.	2.74	1.48	Disagreed
27.	I engage myself with other assignments during the auto mechanics lessons.	2.22	1.67	Disagreed
28.	I don't do any extra studies on auto-mechanics apart from the normal lessons.	2.37	1.67	Disagreed
29.	I dislike auto-mechanics trade because my peer group does not show any interest in it.	2.15	1.41	Disagreed
30.	Auto-mechanics students are not neat in dressing; therefore, I don't like the trade.	2.26	1.48	Disagreed
<b>Weighted average</b>		<b>3.25</b>	<b>1.20</b>	<b>Undecided</b>

Source: Field Survey, 2021

Analysis of data in table 3 shows the mean and standard deviation of responses on motor vehicle mechanics interest inventory before treatment was given to the respondents. The table reveals that the respondents agreed to item 1, 2, 4, 5, 9, 15 to 19, 21, 24 and 25 with mean scores of 4.44, 4.48, 4.33, 4.48, 4.22, 3.59, 4.37, 4.59, 3.89, 3.89, 3.89, 4.00 and 3.81 respectively. The respondents disagreed with item 7, 8, 10, 11, 20, 23, and 26 to 30 with mean scores of 2.78, 2.74, 2.56, 2.30, 2.48, 2.26, 2.74, 2.22, 2.37, 2.15 and 2.26 respectively. In addition, the respondents were undecided for items 3, 6, 13, and 22, with mean scores of 3.11, 3.26, 3.37 and 3.44 respectively. All the 30 item constructs have standard deviation ranging from 0.57 to 1.78 which shows the responses are not widespread as they are close to the mean. The table has a grand calculated weighted average mean and standard deviation of 3.25 and 1.20 respectively. This means that the responses of the respondents indicated they were undecided. This implied that motor vehicle mechanics interest inventory before treatment were undecided.

**Table 4: Mean and standard deviation of responses on motor vehicle mechanics interest inventory after treatment**

S/N	Item Statements	$\bar{X}$	SD	Remark
1.	Motor vehicle mechanics subjects are simple to understand.	5.00	0.00	Strongly Agreed
2.	Auto-mechanics class is very interesting.	5.00	0.00	Strongly Agreed
3.	Auto-mechanics period is always not interesting.	1.00	0.00	Strongly disagreed
4.	I enjoy participating in Auto-mechanics lesson.	5.00	0.00	Strongly Agreed
5.	I attended Auto-mechanics class regularly.	4.04	0.19	Agreed
6.	It is better to use auto-mechanics periods for other subjects.	1.33	0.68	Strongly disagreed
7.	I dislike auto-mechanics class period because there is no practical activities.	4.37	1.36	Agreed
8.	I don't use to ask questions during auto-mechanics class.	4.56	0.85	Strongly Agreed
9.	I pay more attention in the auto-mechanics class.	4.96	0.19	Strongly Agreed
10.	I don't like discussing about auto-mechanics subjects.	3.00	0.68	Undecided
11.	I don't like doing assignments on auto-mechanics subjects.	2.96	0.71	Disagreed
12.	I always feel sleepy during auto-mechanics lesson.	1.26	0.45	Strongly disagreed
13.	If auto-mechanics teacher/instructor fails to come to the class on time, I can go to his office to call him/her.	4.81	0.79	Strongly Agreed
14.	If auto-mechanics teacher/instructor misses his auto mechanics class, I always feel happy.	1.15	0.77	Strongly disagreed
15.	I prefer auto-mechanics option to any other option in vocational trade.	2.33	1.12	Disagreed
16.	I take interest in studying engine parts	4.93	0.27	Strongly Agreed
17.	Auto-mechanics practical class increases my interest in auto-mechanics trade.	4.93	0.27	Strongly Agreed
18.	Auto-mechanics practical lessons involves students in series of	4.93	0.27	Strongly

19.	activities so that I prefer auto-mechanics syllabus that does not require much drawings.	4.93	0.27	Agreed Strongly
20.	I prefer auto-mechanics syllabus that does not require much practical work.	1.30	1.07	Agreed Strongly disagreed
21.	I take interest in handling automotive faults during practical class.	4.93	0.27	Agreed Strongly
22.	I pay much interest in auto-mechanics lessons more than in any other general subjects.	3.15	1.85	Undecided
23.	I don't take interest in anything involving automotive system.	1.26	0.94	Agreed Strongly disagreed
24.	Automotive systems increase my interest in auto-mechanics trade.	4.93	0.27	Agreed Strongly
25.	I encourage my friends to develop interest in auto-mechanics.	4.93	0.27	Agreed Strongly
26.	The strategies adopted in teaching auto-mechanics subjects by the teachers negatively affect my interest in auto-mechanics.	4.93	0.27	Agreed Strongly
27.	I engage myself with other assignments during the auto mechanics lessons.	3.78	1.45	Agreed
28.	I don't do any extra studies on auto-mechanics apart from the normal lessons.	4.70	0.47	Agreed Strongly
29.	I dislike auto-mechanics trade because my peer group does not show any interest in it.	4.33	0.92	Agreed
30.	Auto-mechanics students are not neat in dressing; therefore, I don't like the trade.	1.78	1.12	Agreed Strongly disagreed
<b>Weighted average</b>		<b>3.68</b>	<b>0.62</b>	<b>Agreed</b>

Source: Field Survey, 2021

Analysis of data in table 4 shows the mean and standard deviation of responses on motor vehicle mechanics interest inventory after treatment was given to the respondents. The table reveals that the respondents strongly agreed to items 1, 2, 4, 8, 9, 13, 16 to 19, 21, 24 to 26 and 28 with mean scores of ranging from 4.56 to 5.00. The same way the respondents agreed with item 5, 27 and 29 with mean scores of 4.04, 3.78 and 4.33 respectively. Also, the respondents disagreed with item construct 15 with mean score of 2.33 and strongly disagreed with item 3, 6, 12, 13, 14, 20, 23 and 30 with mean scores of 1.00, 1.33, 1.26, 1.15, 1.30, 1.26, and 1.78 respectively. In addition, the respondents indicated undecided for items 10 and 22 with mean 3.00 and 3.15. All the 30 item constructs have standard deviation ranging from 0.00 to 1.45 which shows the responses are not widespread as they are close to the mean. The table has a grand calculated weighted average mean and standard deviation of 3.68 and 0.62 respectively. This means that the responses of the respondents indicated they agreed to the constructs in table 4. This implied that motor vehicle mechanics interest inventory after treatment was high.

Research question: What is the effect of constructed petrol engine model on academic achievement of motor vehicle mechanics students in technical colleges in Borno State?

**Table 5: Mean and standard deviation of the effect of constructed petrol engine model on academic achievement of motor vehicle mechanics students**

GROUP	Experimental Group (Petrol engine model)			Control Group		
	N	$\bar{X}$	SD	N	$\bar{X}$	SD
PRE-TEST	30	18.50	7.37	28	17.07	4.47
POST-TEST	30	69.47	14.7	28	48.00	5.11
MEAN & SD DIFFERENCE		50.97	7.33		30.93	0.64

Source: Field experiment, 2021

The data presented in Table 5 revealed that the experimental group (constructed petrol engine model group) had a mean score of 18.50 in the pretest and a mean score of 69.47 in the post-test with standard deviation of 7.37 and 14.7 for the pre-test and post-test respectively, pre-test ( $\bar{x} = 18.50$ ; SD = 7.37), post-test ( $\bar{x} = 69.47$ ; SD = 14.7). The result gave a pre-test, post-test mean gain of the experimental group (constructed petrol engine model) to be 50.97. The low standard deviation difference (7.33) showed that the scores of students in both the pre-test and post-test are clustered around their respective mean scores. The control group had a mean score of 17.07 and standard deviation of 4.47 ( $\bar{x} = 17.07$ ; SD = 4.47) in the pretest and mean score of 48.00 and standard deviation of 5.11 ( $\bar{x} = 48.00$ ; SD = 5.11) in the post-test, giving a pre-test post-test mean gain in the control group to be 30.93. With this result, it is clear that constructed petrol engine model is effective in improving academic achievement of motor vehicle mechanics students in technical colleges.

### **Test of Hypotheses**

The null hypotheses for the study were tested using Analysis of Covariance (ANCOVA). The null hypotheses were tested at 0.05 level of significance.

**H<sub>01</sub>:** There is no significant effect of constructed petrol engine model on achievement of motor vehicle mechanics students in technical colleges in Borno State.

**Table 6: Summary of Analysis of Covariance (ANCOVA) for Test of Significance of effect of constructed petrol engine model on achievement of motor vehicle mechanics students in technical colleges**

<b>Source</b>	<b>Type III Sum of Squares</b>	<b>Df</b>	<b>Mean Square</b>	<b>F</b>	<b>Sig.</b>
Corrected Model	6968.870a	3	399.142	18.738	.000
Intercept	193175.869	1	120861.166	1.558E3	.000
Gender	52.745	1	4624.393	.425	.517
Treatment	6513.766	1	89.578	52.542	.000
Treatment * Gender	229.049	1	178.979	1.848	.180
Error	6694.510	54	40.446		
Total	216270.000	58	74.533		
Corrected Total	13663.379	57			

a. R Squared = .510 (Adjusted R Squared = .483)

Source: Field experiment, 2021

The data presented in Table 6 showed F-calculated values for effects of constructed petrol engine model on achievement of motor vehicle mechanics students in technical. The Table showed that there was significant main effect of constructed petrol engine model on achievement of motor

vehicle mechanics students in technical colleges ( $F= 52.542$ ;  $P = .000$ ). Hence, the null hypothesis that stated that there is no significant effect of constructed petrol engine model on achievement of motor vehicle mechanics students in technical colleges in Borno State was therefore rejected. This implied that constructed petrol engine model has positive effect on the achievement of motor vehicle mechanics students in technical colleges. This means that the effect observed are due to the main treatment given to students.

**H<sub>02</sub>:** There is no significant interaction effect of treatment and gender on the achievement of motor vehicle mechanics students in technical colleges in Borno State.

**Table 7: Summary of Analysis of Covariance (ANCOVA) for Test of Significance of effect of treatment and gender on achievement of motor vehicle mechanics students in technical colleges**

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	6968.870a	3	399.142	18.738	.000
Intercept	193175.869	1	120861.166	1.558E3	.000
Gender	52.745	1	4624.393	.425	.517
Treatment	6513.766	1	89.578	52.542	.000
Treatment * Gender	229.049	1	178.979	1.848	.180
Error	6694.510	54	40.446		
Total	216270.000	58	74.533		
Corrected Total	13663.379	57			

a. R Squared = .510 (Adjusted R Squared = .483)

Source: Field experiment, 2021

The data presented in Table 7 showed F-calculated value for interaction effect of treatment and gender on achievement of motor vehicle mechanics students in technical colleges. The Table showed that there was no significant interaction effect of treatments and gender on the achievement of motor vehicle mechanics students in technical colleges ( $F=2.923$ ;  $P=1.848$ ). Hence, the null hypothesis that stated that there is no significant interaction effect of treatments and gender on the achievement of motor vehicle mechanics students was therefore not rejected. This implied that interaction of treatment and gender has no effect on the achievement of motor vehicle mechanics students in technical colleges. This means that the effects observed are due to the main treatment given to students.

#### **Summary of Major Findings of the Study**

1. Motor vehicle mechanics interest inventory before treatment were undecided (Mean 3.25, SD 1.20)
2. Motor vehicle mechanics interest inventory after treatment was high (mean 3.68, SD 0.62)
3. Constructed petrol engine model has positive effect on the achievement of motor vehicle mechanics students in technical colleges ( $F=52.542$ ;  $P=.000$ ).
4. Interaction of treatment and gender has no effect on the achievement of motor vehicle mechanics students in technical colleges ( $F=2.923$ ;  $P=1.848$ ).

#### **Discussion of the Result**

The study revealed that motor vehicle mechanics interest inventory of the students of technical college in Borno State did not signify whether the students have interest in motor

vehicle mechanics. The weighted average mean score was mean 3.25 which was below mean score of 3.50 which was the decision rule to whether consider an item as a factor or not. This implies that the students had no interest in motor vehicle mechanics before the treatment (experiment). This is likely attributed inappropriate method of teaching as observed by Paden and Dereshiwsky (2007) and Omenka (2010) attributed the low achievement and interest rate in technical students to conventional teaching method mainly adopted by teachers. The conventional methods of teaching which are teachers centered that is persistently used for years is now gaining poorer results when compared with the modern and revolutionary teaching methods (Jackson, 2012).

The study also revealed that motor vehicle mechanics interest inventory after treatment was high (mean 3.68). This implies that motor vehicle mechanics interest inventory was influenced by the treatment. Therefore, experimentation (constructed motor vehicle engine model) had significant effect on interest of the students. The findings of this study is in line with the opinions of Ogwo and Oranu (2006) who laid emphasis on the need for teachers to use stimulating strategies which lead to better retention of subject matter without which students' achievement will be minimal. Interest is a persisting tendency to pay attention and enjoy some activities (Jimoh, 2010).

The study also discovered that constructed petrol engine model has positive effect on the achievement of motor vehicle mechanics students in technical college. To support this finding is Neekpoa (2007) who opined that as technology is changing, the auto-technicians must change with the technology so that the level of their thinking in dealings with various diagnoses, repairs, and maintenance of motor vehicles should be commensurate with maintenance need of today's automobile. In other words, students need to be equipped with higher order thinking skills for easy adaptability. The best way to make learning more concrete is to make use of real objects and in some situations, real object may either be too large or complex that hidden details are obscured. This situation arises in the study of some aspects of automobile. The study also revealed that interaction of treatment and gender has no effect on the achievement of motor vehicle mechanics students in technical colleges. This finding is in contradiction with the opinion of Jimoh (2010) who affirmed that it is pertinent that auto-mechanics teachers should use teaching strategy which ensures gender active involvement in learning.

### **Conclusion**

The study concluded that experiment (constructed motor vehicle engine model) has significant effect on motor vehicle mechanics students interest. Constructed petrol engine model has positive effect on the achievement of motor vehicle mechanics students in technical colleges; interaction of treatment and gender has no effect on the achievement of motor vehicle mechanics students in technical colleges. Therefore, teachers should make use of real objects.

### **Recommendations**

Based on the findings of the study, the followings are the recommendations:

1. The constructed petrol engine model should be used in teaching and learning of petrol engine lesson in technical colleges in Borno State

2. Government should encourage the funding of construction of petrol model for the purpose of enhancing teaching and learning of motor vehicle mechanic course in technical colleges across the State.

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