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# EFFECTS OF CONSTRUCTIVIST INSTRUCTIONAL METHOD ON LOW ACHIEVERS' ACADEMIC PERFORMANCE AND RETENTION IN AUTOMECHANICS IN TECHNICAL COLLEGES

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## ABSTRACT

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### Keywords

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The study determined the effects of constructivist instructional method on low achievers' academic performance and retention in automechanics in technical colleges. Two research questions guided the study and two hypotheses tested at 0.05 level of significance. The study was a non-randomized quasi experimental research design. The population was 121 National Technical College II (NTC II) students offering automechanics trade. Two intact classes with a sample size of 88 were purposively selected from technical colleges in the State. Automechanics Performance Test (APT) was used to collect data. Findings revealed that low achievers taught automechanics using constructivist instructional method performed better with higher post-test and retention scores than those taught with conventional method. It was concluded that constructivist instructional method could enhance students' academic performance and retention in automechanics. Hence, teachers should be made to use the method in teaching to enable students with learning difficulties learn and retain concepts so as to improve their academic performance.

**Contribution/Originality:** The paper primary contribution is finding that constructivist instructional method could enhance students' academic performance and retention in automechanics.

## 1. INTRODUCTION

Education can be defined as a process of acquiring knowledge and experience for personal development and socio-economic development of the nation. This process can be formal or informal with distinctive attributes. According to Markus (2009) the quality of any educational programme underscores its ability to equip its recipients with practical and saleable skills to advance its economy optimally. Practical skill acquisition is basically associated with technical colleges in Nigeria. Technical college system was adopted as the first level of post basic education with common curriculum in all the technical colleges accredited by National Board for Technical Education (NBTE) in Nigeria (Federal Republic of Nigeria, 2013).

Establishment of technical colleges makes it imperative to embrace a brand of educational practice that could provide easy access for individual survival as well as national transformation. Sequel to this, technical education constitutes general education, the study of technologies and related sciences and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life (FRN, 2013). Pursuance of the foregoing goals, technical college programmes are offered at two levels leading to the award of National Technical Certificate (NTC) and Advanced National Technical Certificate (ANTC) for craftsmen

and master craftsmen respectively (Federal Ministry of Education, 2000). More so, Technical College curriculum was split into different trades with corresponding modules to enable learners not only make informed career choices but also, be able to graduate successfully. Among such trades offered at technical colleges are electrical engineering trade with its components and mechanical engineering trades whose components include automechanics technology, welding and fabrication engineering as well as craft practice.

Automechanics technology is one of the mechanical trade subjects offered under Motor Vehicle Mechanic work in Nigerian Technical Colleges (FRN, 2013). This trade involves the application of scientific knowledge in the design, selection of materials, construction, operation and maintenance of automobile devices (Nigerian Educational Research and Development Council (NERDC), 2007). The programme is aimed at producing craftsmen who would be able to test, diagnose, service, refurbish and completely repair any fault relating to the automobiles to the manufacturers' specifications. Hence, motor vehicle mechanics curriculum used in technical colleges is designed to offer general education subjects in addition to occupational trade components which invariably expose learners to basic theories, workshop practices, industrial training components and small business management as well as entrepreneurial training (FRN, 2013; Okoye and Okoye, 2015). To this end, the curriculum was configured to impart in learners specialized knowledge and requisite competencies to enhance their creative acumen and employment opportunities, which would in turn result in socio-economic and technological development of the country.

The attainment of technological development is quite a difficult task especially now that technology is digitally driven at an unprecedented speed. Evidently, motor vehicle industry is in the frontier of technological dynamism which promotes competitiveness and innovative exploits which add value to human existence. Such innovations include: manufacturing of high speed cars with high fuel economy, invention of hybrid cars which defiles the primacy of hydrocarbon gas with its attendant destructive effects to the green house (ozone layer); the installations of sensory devices which make it possible for someone, with the aid of a remote control, to operate the car from a distance and also track and recover a stolen vehicle among other innovations. These innovations do not only make the industry highly competitive but also demand effective training and development of competent craftsmen and allied professionals who would apply their skills to meeting the yearning demands of technological changes.

Incidentally, Ezeugwu in Okoye (2013) maintained that automobile industry in Nigeria is fraught with some incompetent road side mechanics who, while in attempt to repair already diagnosed faults in cars, create more problems or even render the car perpetually irreparable. This could be attributed to lack requisite expertise among them hence often resort to trial and error approach in order to correct the fault, which usually does not conform to manufactures' specifications. The practice has thrived because automechanics graduates seem to lack the needed competencies to perform the expected roles in the workshops. Nevertheless, out of all the factors attributed to this scenario, teachers' teaching methods appeared the most susceptible factor, and therefore calls for adoption of effective methods of teaching automechanics to enable learners acquire workplace competencies in order achieve excellent results and also perform well in the industry. Sequel to this, Royles (2013) and Motibodhi (2014) affirmed that technical education teachers should be adequately trained to be able to inculcate in students, scientific knowledge and workplace basic skills, such as learning to learn, technical and interpersonal/communication skills, higher order thinking skills, problem-solving, creative thinking and ability to work in teams.

The failure of technical education graduates to manifest these skills could be attributed the following factors, namely lack of appropriate teaching facilities, dearth of qualified teachers, students' attitudes to their studies, poor funding and inappropriate teaching methods; which summarily resulted in poor academic performance of students especially in automechanics. To this end, NABTEB Chief Examiners' Report (2013) affirmed that the academic performance of automechanics students in the past years has not been encouraging and emphasized the imperative of adopting teaching methods rooted in cognitive psychological learning theories. Constructivist instructional method is one of such methods. According to Brook and Brook (2005) constructivists teaching method is a student-

centred teaching method which enables students to construct new knowledge and understanding based on what they already know and believe. Royles (2013) further affirmed that constructivist learning involves mastery of authentic task in meaningful and realistic situations that could enable learners build internal knowledge based on personal interpretation of experiences. This implies that learning through personal interpretation of experience could bridge the gap that brings about learning difficulty often associated with the use of conventional teaching methods which make learners passive and as a result could easily forget what was taught.

According to Albaoni (2010) conventional teaching methods are teacher-centered which assigns the teacher the role of transferring information and directing the students as passive receivers. This is contrary to constructivist learning environment where students' roles are to organize the learning environment, carry out the learning activities, build up their knowledge and monitor their own learning, while the teacher guides the learning process (Skinkyse, 2012). Gray (2005) further opined that activities in a constructivist classroom are democratic, interactive and student-centered. This implies that, students are responsible and autonomous while the teacher facilitates the learning process. Hence, this study adopted and optimized five constructivist teaching strategies, namely: collaborative learning, oral discussion, authentic learning, critical thinking skills and framing strategies.

Academic performance of students in this context is perceived as the learning outcome of students on a subject showing the extent of mastery on the subject matter (Ibudo, 2013). Also Hodson (2009) defined academic performance as learning outcome in school subject as symbolized by scores or marks obtained by students following organized evaluation processes. As regards this study, academic performance implies the quality and amount of competencies and knowledge acquired and utilized by automechanics students. Hodson further asserted that such competencies and skills could be tested over time through a standard process in order to ascertain the extent of impartation as indicated by learners' scores. According to Lowell (2012) students who got 60% and above, are regarded as high-achievers while, those who scored 59% and below are low-achievers. By implication, learners who got high scores are said to have performed well while the low-achievers, indicates shallow learning and poor retention of knowledge. Retention of learning is simply the ability to remember what has been learnt. According to Momoh-otte in Eze (2014) retention of learning is the repeated performance of behaviour earlier acquired by the learner and elicited after an interval of time. However, the nature of instruction *visa vis* the teaching method could facilitate retention (Demmert, 2001; Runnei, 2012). Shrun and Glinson (2013) also contended that the use of appropriate teaching method could avail students the opportunity to learn from what they know and as well grasp practical skills. To this end, Maryourt (2013) maintained that the use of activity-based teaching method in teaching psychomotor-related subjects could enhance students' retention which could in turn improve their academic achievement. This implies that the use of activity-based teaching method such as constructivist instructional method could facilitate understanding and mastery of concepts. Hence, the study ascertained the effects of constructivist instructional method on low achievers' academic performance and retention in automechanics in technical colleges.

### *1.1. Purpose of the Study*

Specifically, the study determined the effect of:

1. Constructivist instructional method on low-achievers' academic performance in automechanics when compared with those taught with conventional method using their pre-test and post-test mean scores.
2. Constructivist instructional method on low-achievers' retention in automechanics when compared with those taught with conventional method using their retention scores.

### *1.2. Research Questions*

The following research questions guided the study:

1. What is the effect of constructivist instructional method on low-achievers academic performance in automechanics when compared with those taught with conventional method using their pre-test and post-test mean scores?
2. What is the effect of constructivist instructional method on low-achievers' retention in automechanics when compared with those taught with conventional method using their retention scores?

### 1.3. Hypotheses

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

1. *There is no significant difference between the pre-test and post-test mean scores of low-achievers taught automechanics using constructivist instructional method and those taught with conventional method.*
2. *There is no significant difference between the retention mean scores of low-achievers taught automechanics with constructivist instructional method and those taught using conventional method.*

## 2. METHOD

The study adopted quasi-experimental research design of pretest, post-test, non-equivalent control group design involving two schools but no randomization (intact or pre-existing classes). The design concurs with the assertion of Uzoagulu (2011) that quasi experimental design is best used when intact classes are used and non-randomization of subject is applied.

The study was conducted in technical colleges in Anambra State. The State has many NBTE-accredited technical colleges offering motor vehicle mechanic work as well as a wide spread distribution of automobile workshops which need the services of well-trained automobile craftsmen produced in technical colleges. The population of the study was 121 National Technical Certificate with a sample size of 88 NTC II students, who were grouped into experimental and control classes. Experimental group had 42 students while control group had 46 students. The two schools were selected from different Local Government Areas of the state. The choice of colleges was carefully made so as to remove interaction effect among students in different treatment groups.

Data were collected using Automechanics Performance Test (APT) adopted from past NABTEB question papers. Forty APT multiple choice objective test items with four options (A-D) was used for the pre-test, post-test and retention-test. In order to differentiate the pre-test from the post-test and retention-test; the colour of the paper was changed and items reshuffled with the numbering changed. The instrument was content validated by three experts while the reliability yielded 0.75 through Cronbach Alpha reliability Coefficient.

### 2.1. Experimental Procedures

The researcher having obtained permission from the authorities concerned, briefed automechanics teachers on how to carry out the exercise, and accordingly handed them in the lesson plans which lasted for 80 minutes per week. In compliance with briefing, the teachers on the first week administered the pre-test before the commencement of the treatment. At the end of the four week study, they administered the post-test as well as the delayed post-test two weeks after the post-test and forwarded the answer booklets to the researcher who marked and analyzed the data using mean scores and analysis of covariance (ANCOVA). Mean was used to answer the research questions while ANCOVA was used to test the hypotheses at 0.05 level of significance.

In answering research questions, students' performances were determined in terms of mean scores and mean gains. Difference between post-test and pre-test mean scores indicated mean gain/mean loss. In the test of null hypotheses using ANCOVA, the null hypothesis was not significant if the p-value was greater or equal to the level of significance (0.05), otherwise, the null hypothesis was significant ( $p\text{-value} \leq 0.05$ ).

### 3. RESULT

Analysis of data for the research questions and hypotheses are presented as follow:

*Research Question 1:* What differences exist between the pre-test and post-test mean academic performance scores of low achievers taught automechanics using constructivist instructional method and those taught with conventional method?

**Table-1.** Mean of pre-test and post-test academic performance scores of low achievers in experimental and control groups.

Group	N	Pre-test mean	Post-test mean	Mean gain
Experimental Groups	42	17.3095	30.5714	13.2619
Control groups	46	14.2391	25.1522	10.9131

SPSS analysis of the pre-test and post-test mean scores of the groups.

Data presented in Table 1 show that the pre-test and post-test mean performance scores of students taught with constructivist instructional method are 17.3095 and 30.5714 with mean gain of 13.2619 respectively, while those taught using conventional method have 14.2391 and 25.1522 with mean gain of 10.9131 respectively. The results indicate that experimental group had higher mean gain. This further shows that the treatment given to the experimental group enhanced their mastery of learning.

*Research Question 2:* What is the difference in retention mean academic performance scores of low achievers taught automechanics using constructivist instructional method and those taught with conventional method?

**Table-2.** Mean retention scores of low achievers taught automechanics in experimental and control groups.

Group	N	Delayed post-test mean	Mean difference
Experimental Groups	42	33.5714	9.6366
Control groups	46	23.9348	

SPSS analysis of the retention mean scores of the groups.

*Research Question 3:* What is the difference in retention mean scores of low achievers taught automechanics using constructivist instructional method and those taught with conventional method?

Table 2 shows the mean retention scores of 33.5714 for the experimental groups and 23.9348 for the control groups with mean difference of 9.6366. This shows that the experimental groups had higher retention scores than the control groups.

*Hypotheses 1:* There is no significant difference between the pre-test and post-test mean academic performance scores of low achievers taught automechanics using constructivist instructional method and those taught with conventional method.

**Table-3.** ANCOVA summary of constructivist instructional method and conventional method for low achievers' academic performance in automechanics.

Source	Type III sum of squares	df	Mean square	F	p-value	Remarks
Corrected model	8.384 <sup>a</sup>	4	2.096	12.950	0.000	
Intercept	28.858	1	28.858	178.293	0.000	
Pretest	.099	1	0.099	.613	0.436	
Posttest	1.005	1	1.005	6.212	0.015	Significant
Error	13.434	83	0.162			
Total	1072.000		88			
Corrected total	21.818	87				

Source: SPSSANCOVA analysis.

Table 3 shows that at 0.05 level of significance with 1 degree of freedom (df), the p-value is 0.000 which is lower than 0.05 level of significance. This shows that there is significant difference in mean performance scores of low achievers taught automechanics using constructivist instructional method and those taught with conventional method. Based on this result, the null hypothesis was therefore rejected.

*Hypothesis 2: There is no significant difference between the delayed posttest mean academic performance scores of students taught automechanics using constructivist instructional method and those taught with conventional method.*

**Table-4.** ANCOVA summary of constructivist instructional method and conventional method for low achievers' retention scores in automechanics.

Source	Type III sum of squares	df	Mean square	F	p-value	Remarks
Corrected Model	7.172a	2	3.586	20.811	.000	
Intercept	30.177	1	30.177	175.133	.000	
Delay posttest	6.973	1	6.973	40.467	.000	
Method	4.511	1	4.511	26.181	.000	Significant
Error	14.646	85	.172			
Total	1072.000	88				
Corrected total	21.818	87				

A R Squared = .329 (Adjusted R Squared = .313).

Table 4 shows that at 0.05 level of significance with 1 degree of freedom, the p-value is 0.000 which is lower than the level of significance 0.05. This indicates that there is significant difference in mean retention scores of low achievers taught automechanics using constructivist instructional method and those taught with conventional method. Hence, the null hypothesis was rejected.

#### 4. DISCUSSION OF FINDINGS

The study revealed that the pre-test and post-test mean performance scores of low achievers taught automechanics with constructivist instructional method were higher than scores of those taught using conventional method. This result concurs to the assertions of Royles (2013) and Thanasouls (2005) that teaching methods based on constructivism help students to construct new knowledge and understanding in respect of what they have already known or believe. Kim (2005) also found that constructivist instructional approach was more effective than conventional method. This portends that constructivist instructional method enhances students' learning ability through active learning. Hence, the mean post-test scores of students taught automechanics using both methods varied significantly.

The study showed that low achievers taught automechanics using constructivist instructional method had higher retention scores than those taught using conventional method. This implies that constructivist instructional method if systematically employed in teaching and learning encourages students to learn and retain what they have learnt. This is in line with the findings of Ausubel and Robinson (2002) and Nayak (2013) which upheld that constructivist instructional method not only encourages students to learn and retain concept very well and also improves their academic performance. On the other hand, the test of hypothesis showed that retention scores of students taught with both methods differ significantly in favour of those in experimental classes.

#### 5. CONCLUSION

The study showed that constructivist instructional method impacted on academic performance and retention of low achievers (students) in automechanics. This indicates that constructivist instructional method is an effective method of teaching low achievers in automechanics at NTC level; hence, it enabled them to not only learn with ease, but also retain what was taught for an appreciable span of time.

#### 6. RECOMMENDATIONS

Based on the findings, the following recommendations were proffered:

1. Automechanics teachers should employ constructivist instructional method in teaching so as to enable students learn and retain knowledge in order to enhance their academic performance.

2. The school time table should be configured to accommodate, encourage and motivate students to consistently use constructivist instructional method in learning. This could enable them explore and exploit their creativity in knowledge application for enhanced academic performance and retention.
3. The curriculum planners of technical college programmes should collaborate with automechanics professionals to develop a workable Motor vehicle mechanics work curriculum that will accommodate teachers' use of constructivist instructional method for effective instructional delivery.
4. Government should provide technical colleges with not only modern tools and equipment but also ensure that constructivist instructional method is consistently used for knowledge impartation in order to enhance low-achievers' retention in automechanics.

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## APPENDIX A

**Table-5.** National technical certificate examination performance statistics on motor vehicle work trade of all the government technical colleges (GTC) in Anambra State from 2011 – 2015.

Year	No of students	A	B	C	P	Total passed	% passed	Students failed	% failed
2011	24	-	-	10	4	14	58.30%	10	42%
2012	40	-	-	13	12	25	62.5%	15	37.5%
2013	45	2	-	20	9	31	68.8%	14	31.1%
2014	38	-	-	13	10	23	60.5%	15	39.5%
2015	55	-	-	25	10	35	63.6%		36.4%

Source: National business and technical examination board (NABTEB) headquarters, Benin-Edo State.

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