EFFECTS OF CONSTRUCTIVIST INSTRUCTIONAL METHOD ON ACADEMIC PERFORMANCE AND RETENTION OFAUTOMECHANICS STUDENTS IN TECHNICAL COLLEGES.

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Abstract
The inability of automechanics students to perform excellently well in examinations has been attributed to use of inappropriate instructional method. Hence, the study investigated the effect of constructivist instructional method on academic performance and retention of automechanics students in technical colleges in Anambra State. Two research questions guided the study and two hypotheses were 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. Purposive sampling technique was used to select four intact classes in technical colleges from different Local Government Areas of the State. A sample size of 88 was studied. The instrument for data collection was Automechanics Performance Test (APT) which contained 40 objective questions. Three experts validated the instrument. The reliability of the instrument was established through test-retest method using Pearson Product Moment Correlation, which yielded 0.75 reliability coefficient. Mean was used to analyze data relating to research questions while Analysis of Covariance (ANCOVA) was used to test the null hypotheses at
0.05 level of significance. Both experimental and control groups were pre-tested and taught by their regular teachers for four weeks using the lesson plans prepared by the researcher. A post-test was administered immediately after teaching, followed by a delayed post-test after two weeks to ascertain the retention level of the students. Findings revealed that students taught automechanics using constructivist instructional method performed better with higher post-test scores than those taught with lecture method. Based on the findings, it was concluded that constructivist instructional method could enhance students' academic performance and retention in automechanics. Hence, it was recommended among others that automechanics teachers should use constructivist instructional method to enable students learn and retain concepts for improved academic performance.

Keywords: ***Constructivist Instructional Method, Automechanics, Academic Performance and Retention.***

Introduction

Education is the process of acquiring knowledge and experience for personal development and sustainability. This process can be formal or informal with distinctive attributes. According to Markus (2009) the quality of any educational programme lies on its ability to transform its recipients by equipping them with practical and saleable skills.
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, FRN, 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 development. Hence, 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). In order to achieve 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 (FME), 2000). That is why, Technical College curriculum was split into different trades with corresponding modules so as to enable learners chose and accomplish trades of their interest 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 exposes learners to basic theories, workshop practices, industrial training components and small business management as well as entrepreneurial training (FRN, 2013). The curriculum is also aimed at imparting specialized knowledge and requisite competencies in learners in order to enhance their academic performance and employment opportunities. This will in turn improve socio-economic and technological development of the country.

The attainment of technological development is quite a difficult task especially now that technology is rapidly evolving and is being digitally driven at an unprecedented speed.

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Evidently, the motor vehicle industry is actively involved in the dynamism of technological competitiveness with enormous innovations that have added much value to activities of human kind. 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.

Unfortunately, Ezeugwu in Okoye (2013) opined that automobile industry in Nigeria is fraught with quack road side mechanics who, while struggling to repair already diagnosed faults in cars, create more problems or even render the car perpetually irreparable. This could be because they lack requisite practical skills and training hence often resort to trial and error approach in order to correct the fault. This phenomenon makes the vehicle mechanics appear incompetent before their customers who are left with no alternative than to engage their (the mechanics) services in order to repair their vehicles. The practice has been a recurring decimal because automechanics graduates seem to lack the needed competencies to operate their own workshops. This situation calls for application of effective methods of teaching automechanics to Nigerian students so as to enable them possess workplace competencies to fit into the industry and compete favourably among their counterparts elsewhere on the globe.

In this regard, Royles (2013) and Motibodhi (2014) suggested that technical education institutions should be repositioned to inculcate in students academic skills and workplace basic and practical skills. Basic workplace skills include learning to learn, technical and interpersonal/communication skills, higher order thinking skills (such as decision making, problem-solving and flexibility), creative thinking and ability to work in teams which would make the students adaptable to present and future changes.

Unfortunately, these skills are hardly found in technology/technical education graduates owing to various factors, such as lack of facilities, poor funding and inappropriate teaching methods; which result in poor academic performance of students especially in automechanics. This poor academic performance is evident from the statistics of National Technical Certificate Examination Result on Motor Vehicle Work Trade of all the Government Technical Colleges (GTC) in Anambra State in the past five years shown in figure 1.

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	4	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%	20	36.4%

Figure 1.Source: National Business and Technical Examination Board (NABTEB) Headquarters,Benin-Edo State.

Also, NABTEB Chief Examiners' Report (2013) revealed that the academic performance of automechanics students in the past years has been poor. The report implicated poor grammatical expression; poor drawing and sketching skills; poor computation skills and inability to relate questions to practical skills to mention a few. This makes it imperative to adopt teaching methods rooted in cognitive psychological learning theories. Constructivist instructional method is one of such approaches. According to Brooks and Brooks (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. Hence, mastery enables learners build internal illustrations of knowledge based on personal interpretation of experiences. The foregoing view substantiates the assertion of Ogwo and Oranu (2006), which holds 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 (Skinlyse, 2012). Gray (2005) further opined that activities in a constructivist classroom are democratic, interactive and student-centered. Hence, students are responsible and autonomous while the teacher facilitates the learning process. Therefore, this study adopted and appropriately used five constructivist teaching strategies, namely: collaborative learning, oral discussion, authentic learning, critical thinking skills and framing strategies.

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Academic performance of students in this context is perceived as the performance or 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. Hence, academic performance in respect of this study implies the quality and amount of competencies and knowledge acquired and utilized by automechanics students. Hodson further asserts 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. By implication, learners who got high scores are said to have performed well while those with low scores are termed poor performers, indicating shallow learning and poor retention ofknowledge.

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 performance irrespective of their ability level. This portends that the use of activity-based teaching method rooted in constructivist instructional method could make a difference in students' academic performance since it facilitates understanding and mastery of concepts. Hence, the study ascertained the effect of constructivist instructional method on academic performance and retention of automechanics students in technical colleges.

Statement of the Problem

The inability of automechanics graduates to obtain excellent results both in internal and external examinations grossly negates the objectives of technical education. This is evident in consistent poor academic performance of automechanics students observed in academic sessions under review. Apparently, the result showed that automechanics students have never achieved exceptionally good results (high grade), but rather they seemed to be on the average with consistent pass grade as shown in figure 1 on page 4.

This has become worrisome to educationists who attributed students' poor academic performance and retention to a number of factors, such as lack of instructional materials, dearth of committed teachers, nonchalant attitude of students to their study and use of inappropriate teaching methods. This notion concurs with Yalams and Fatoku (2007) which reported that students' study habits, school environment, lack of facilities and teaching methods are contributory factors for students' poor academic performance. Similarly, Oranu

(2003) and NABTEB Chief Examiners' Report (2013) reported that use of inappropriate teaching method was ultimately responsible for poor academic performance of technical college students in Nigerian; thereby suggested that, conventional teaching method (teacher-centered approach) should be thoughtfully substituted with student-centred teaching method to encourage students' active participation in the learning process.

This situation calls for a paradigm shift to instructional approach that exposes automechanics students to activities that could enhance construction of meaning for improved performance; otherwise they would continue to perform poorly academically. This could worsen the prevalent problem of low enrollment, production of incompetent/unemployable graduates and colossal debasement of public image of technical education. Hence, the need for use of appropriate teaching methods that could arouse students' curiosity and interest to learn, comprehend and retain learning so as to perform excellently in examinations. Against this backdrop, the researchers determined the effects of constructivist instructional method on academic performance and retention of automechanics students in technical colleges.

Purpose of the Study

Specifically, the study determined:

1. differences in the pre-test and post-test mean academic performance scores of students taught automechanics using constructivist instructional method and those taught with lecture method.
2. differences in the mean retention (delayed post-test) academic performance scores of students taught automechanics using constructivist instructional method and those taught with lecture method.

Research Questions

The following research questions guided the study:

1. What differences exist between the pre-test and post-test mean academic performance scores of students taught automechanics using constructivist instructional method and those taught with lecture method?
2. What is the difference in retention (delayed post-test) mean academic performance scores of students taught automechanics using constructivist instructional method and those taught with lecture method?

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 academic performance scores of students taught automechanics using constructivist instructional method and those taught with lecture method.

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2. There is no significant difference between the delayed post test mean academic performance scores of students taught automechanics using constructivist instructional method and those taught with lecture method.

Method

The study adopted quasi-experimental research design. Specifically, pre-test, post-test, non-equivalent control group design involving four schools but non randomization (intact or pre-existing classes) was used for the study. 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 (NTC) II students offering automechanics. A purposive sampling technique was used to select four schools based on the number of students offering automechanics, availability of professionally qualified staff and facilities for teaching. The sample size of the study was 88 NTC II students, who were grouped into experimental and control classes. Experimental group had 42 students while control group had 46 students. The four 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.

Instrument for Data Collection

The instrument for data collection was 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 delayed post-test. In order to differentiate the pre-test from the post-test and delayed post-test; the colour of the paper was changed and items reshuffled with the numbering changed. The instrument was subjected to face and content validation by three experts who determined the suitability of the items in terms of content coverage, clarity and sequence. Test retest method was used to determine the reliability which yielded 0.75 using Pearson Product Moment Correlation Coefficient. The instrument was further subjected to difficulty and discrimination indices in order to ascertain the suitability of the questions. After computing the difficulty and discrimination indices, the APT was reduced to forty questions and used for the study.

Experimental Procedures

The researcher sought and obtained permission from the authorities concerned for the involvement of the colleges and automechanics teachers in the study. Following approval

of the college authorities, the researcher engaged the automechanics teachers in an extensive briefing on how to carry out the exercise. Thereafter, teachers for the experimental groups were provided with constructivist lesson plans incorporated with five instructional strategies, namely: collaborative learning, oral discussion, authentic learning, critical thinking skills and framing strategies. On the other hand, teachers for control groups were given conventional lesson plan. The two lesson plans lasted for 80 minutes per week.

Having briefed the automechanics teachers on the modalities involved, the teachers on the first week administered the pre-test before the commencement of the treatment. At the end of the four week study, the teachers administered the post-test as well as the delayed post-test two weeks after the post-test. The APT answer booklets were collected, marked and analyzed by the researcher.

Data collected were analyzed 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. ANCOVA is very effective in controlling the differences associated with pre test, post test group design. 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 showed mean gain/mean loss. In the test of null hypotheses using ANCOVA, the null hypothesis was not rejected if the p-value was greater or equal to the level of significance (0.05), otherwise, the null hypothesis was rejected (p-value = 0.05).

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 students taught automechanics using constructivist instructional method and those taught with lecture method?

Table 1:
Mean of Pre-Test and Post-Test Academic Performance Scores for all Students 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

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 lecture method have 14.2391 and

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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 delayed post-test mean academic performance scores of students taught automechanics using constructivist instructional method and those taught with lecture method?

Table 2:
Mean Retention Scores for all Students 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	

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 students taught automechanics using constructivist instructional method and those taught with lecture method.

Table 3:
ANCOVA Summary of Constructivist Instructional Method and Lecture Method for all Students' Academic Performance in Automechanics.

Source	Type III Sum of Squares	df	mean square	F	p-value	Decision
Corrected model	8.384[a]	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	Rejected
Error	13.434	83	0.162			
Total	1072.000	88				
Corrected Total	21.818	87				

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 students taught automechanics using constructivist instructional method and those taught with lecture method. Based on this result, the null hypothesis was therefore rejected.

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

Table 4:
ANCOVA Summary of Constructivist Instructional Method and Lecture Method for all Students' Retention Scores in Automechanics.

Source	Type III Sum of Squares	df	Mean Square	F	p-value	Decision
Corrected Model	7.172a	2	3.586	20.811	.000	
Intercept	30.177	1	30.177	175.133	.000	
Delayposttest	6.973	1	6.973	40.467	.000	Rejected
Method	4.511	1	4.511	26.181	.000	
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 students taught automechanics using constructivist instructional method and those taught with lecture method. Hence, the null hypothesis was rejected.

Discussion of Findings

The study revealed that the pre-test and post-test mean performance scores of students taught automechanics with constructivist instructional method were higher than scores of those taught using lecture method. This result concurs to the assertions of Royles (2013) and Thanasouls (2005) that teaching methods based on constructivism help students to construct

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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 lecture 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 students taught automechanics using constructivist instructional method had higher retention scores than those taught using lecture 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.

Conclusion

The study showed that constructivist instructional method impacted on academic performance and retention of students in automechanics. This implies that constructivist instructional method is an effective method of teaching automechanics at NTC level in the sense that it enabled students to learn very well and also retain what they learnt for a considerable period of time.

Recommendations

Based on the findings, the following recommendations were proffered:

1. Automechanics teachers should adopt constructivist instructional method in teaching automechanics to enable students learn and retain knowledge in order to improve their academic performance.
2. Automechanics students should be encouraged and motivated to consistently use constructivist instructional method in learning. This could make them more creativity in knowledge application and consequently enhance their academic performance and retention.
3. Government should provide technical colleges with modern tools and equipment so as to encourage and sustain the use of constructivist instructional method in imparting requisite skills needed for optimal performance and retention by automechanics students.
4. The curriculum planners of technical college programmes should collaborate with automechanics experts to develop a workable Motor vehicle mechanics work curriculum that will accommodate teachers' use of constructivist instructional method for effective instructional delivery.

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