



Strategies For Improving Motor Vehicle Mechanics Students' Cognitive And Psychomotor Skills Acquisition In Government Science And Technical Colleges In Yobe State, Nigeria

Abubakar Mohammed

**Federal College of Education (Technical), Potiskum, Yobe State, Nigeria
fadilandfadila1971@gmail.com**

ABSTRACT

The main purpose of this study was to determine the strategies for improving Motor Vehicle Mechanics students' cognitive and psychomotor skills acquisition in Government Science and Technical Colleges in Yobe State, the study compared the Jigsaw, Peer/collaboration and Demonstration teaching strategies in Government science and technical colleges in Yobe State Nigeria. It was made up of three purposes with their corresponding three research questions and one null hypotheses tested at 0.05 level of precision. The population of the study was made up of 197 NTC II Motor Vehicle Mechanic Work students, while the sample is made up of 79 NTC II Motor Vehicle Mechanics Work Students. Multistage sampling technique was used as sample of the study. The study adopted quasi-experimental which involved pre-test, post-test, experimental and control groups design. The instrument for the data collection was tagged Motor Vehicle Mechanic Work Performance Test (MVMWPT) adopted from NABTEB past questions papers. The six research questions were answered and the hypotheses were tested. The research questions were answered using mean and standard deviation while hypotheses were tested using Analysis of Covariates (ANCOVA) at 0.05 alpha level. The findings showed that; there was significant difference in the performance of students taught Motor Vehicle Mechanic Work using Jigsaw, Peer/collaboration and demonstration teaching methods Therefore, the null hypothesis was rejected meaning that, there is significant difference among the performance of students taught Motor Vehicle Mechanic Work trade using Jig saw, peer/collaboration and demonstration teaching strategies. Recommendations based on the findings showed that Jigsaw teaching strategy improved students 'performance. The use of Jigsaw teaching strategy in teaching and learning of Motor Vehicle Mechanic Work should be given priority. On-the-job training for technical teachers in form of seminars, workshops and conferences should be organized on how to use Jigsaw teaching methods for teaching Motor Vehicle Mechanic Work students. There should be more supplies of tools, equipment and machines necessary for teaching Motor Vehicle Mechanic Work students effectively.

Keywords: Strategies, Motor Vehicle Mechanics, Cognitive, Psychomotor, Skills Acquisition

INTRODUCTION

The elevation of the human condition is the primary concern of education. Through education people develop their knowledge and skills, adopt new behavior and become better citizens. In Nigeria, education is perceived as the greatest force that could be used to achieve desirable change or development of the nation economically, politically and socially. A vital aspect of Nigerian education process is technical

education. This type of education has been seen as the most reliable instrument for individual and societal survival and development in this changing world. It is not gainsaying that the provision of technical education through any mechanism put in place will enable its recipient to be better, more useful and more productive citizens of the nation (Debrah, Vidal and Dinis, 2021).

Technical education is the catalyst for change in any nation that embraces its practices, that is to say technical education is a useful instrument that brings about improved economy. Different institutions were established to offer technical education, which include Technical Colleges, Polytechnics, Colleges of Education (Technical), Universities of Technology, Vocational Centers, Schools etc. The National Policy on Education (NPE) as cited in Stephen (2020), has placed a premium on technical education in view of its role in technological and industrial development of the nation, it has described technical education as “aspect of education which leads to the acquisition of practical and applied skills as well as basic scientific knowledge”. Technical education aims at:

- i. Providing trained manpower in applied science, technology and business, particularly at craft, advance craft and technical levels;
- ii. Providing the technical knowledge and vocational skills necessary for agricultural, industrial, commercial and economic development; and
- iii. Giving training and impart the necessary skills leading to individual for self-reliant (FRN 2014).

Opara (2017) asserted that emphasis is on skill-acquisition and sound scientific knowledge, which gives ability to the use of hand and machine for the purpose of production, maintenance and self-reliance. Santoso, Mulyoto and Hanif (2020) observed that apart from the inculcation of values, technical education also aims at inculcating intellectual knowledge; understanding and psychomotor skills which can make man live fully and contribute to the development of his society. Santoso et al. pointed further that, the ability of a man to use the things of this world to improve life and living depends on the type, quality and depth of education given to him.

Technical colleges in Nigeria have been training people to become craftsmen and technicians. Training qualifies them for jobs in both public and private sectors of the economy. Both sectors, according to Albayrak and Ziarati (2010), require well-trained and competent technicians who can operate and maintain the available technical equipment. Therefore, there is the need for technologically based skill training that ensures that students understand how their expertise fits into improving the society and fulfilling national goals. Yobe States was not left behind in the establishment of technical colleges to provide an opportunity for productive skills and manpower development for its citizens and the nation in general. Eight technical colleges were established in Yobe State which offers different trades.

Motor Vehicle Mechanics Work as a trade in Technical Colleges is designed to equip every Nigerian students that offers the trade as a subject at the technical college level with cognitive and psychomotor skills in motor vehicle maintenance, servicing and repair after graduation from school. Ogundele, Ogunniran and Abanikandda (2019) states that one of the primary aims of the National Policy on Education that was designed by the Federal Government of Nigeria in 1981 was to equip every Nigerian child with basic skills that will enhance them for the purpose of technological development and advancement in Nigeria. Wu, Huang, Kao, Lue and Chen (2018) described Motor Vehicle Mechanics Technology as education that provides the students with the knowledge and skills with adequate practical experience in the field of professional motor vehicle mechanics technology for national development.

Cognitive and Psychomotor skill acquisition is very necessary at the present stage of Nigeria’s economic and technological development. Topi, *et al.* (2017) stated that the acquisition of skills prepares students for specific occupation in industries and competences to exploit life’s opportunities. Psychomotor skills acquisition remains the major goal of technical education and this helps to satisfy the personal work needs of the individual and the society in general (Chen and Schmidtke, 2018). To acquire psychomotor skills in technical education programs such as Motor Vehicle Mechanics Technology at technical college level, opportunities must be provided for students to practice what they learnt. Małachowski and Korytkowski (2016) explained that a skill is a manual process acquired through repetitive performance of an operation.

The National Policy on Education (FRN, 2014) further places emphasize on the study of technologies and related sciences, and acquisition of practical skills, attitudes, and knowledge relating to occupation in various section of economics and social life.

Consequently, instructions in Technical Colleges today have remained essentially devoid of practical skills in the different trades. The implication is that Technical Colleges are graduating students with inadequate or complete lack of practical skills in the various trade areas. This portrays a bleak future for the attainment of the lofty goals of the National Policy on Education, of making Technical College graduates immediately employable.

The major goal of Technical Colleges where Motor Vehicle Mechanics Work is offered is to prepare students for successful employment in the labor market (FRN, 2014).

Facilities, like classrooms, workshops, laboratories, studios, tools, equipment, machines and materials are grossly inadequate in our technical colleges, especially in Motor Vehicle Mechanics departments, and the difficulty in the procurement of facilities does not give room for skills acquisition. Njura, Kaberia and Taaliu (2020) stated that the impact of inadequate facilities is that training of students becomes impeded and they end up not acquiring the necessary cognitive and psychomotor skills. Another problem is inadequate supervision of practical activities, Vu (2018) states that the usual practice is that practical projects are inspected at the end of the process, but adequate supervision on the whole practical process has a major influence on the overall performance and efficiency of skills acquisition. Similarly, there are insufficient trained technical teachers especially trained Motor Vehicle Mechanics teachers that can actually impart the psychomotor skills on students. Literatures attributed poor technical skills acquisitions to instructional strategies adopted by Motor Vehicle Mechanics instructors, inadequate facilities and inadequate supervision of practical and insufficient trained technical teachers. Based on these facts therefore, there is a need to improve on the existing strategies associated with Motor Vehicle Mechanics Students' Cognitive and Psychomotor Skills acquisition in Government Science and Technical Colleges in Yobe State.

Purpose of the Study

The main purpose of the study determined the strategies for improving Motor Vehicle Mechanics students' cognitive and psychomotor skills acquisition in Government Science and Technical Colleges in Yobe State. The specifically the study:-

1. Determined the performance of Students taught MVMW trade using Jigsaw teaching strategy in Government Science and Technical Colleges in Yobe State
2. Determined the performance of Students taught MVMW trade using Peer teaching strategy in Government Science and Technical Colleges in Yobe State
3. Determined the performance of Students taught MVMW trade using Demonstration teaching strategy in Government Science and Technical Colleges in Yobe State

Research Questions

The following research question were raised to guide the study

1. What is the performance of Students taught MVMW trade using Jigsaw teaching strategy in Government Science and Technical Colleges in Yobe State?
2. What is the performance of Students taught MVMW trade using peer teaching strategy in Government Science and Technical Colleges in Yobe State?
3. What is the performance of Students taught MVMW trade using Demonstration teaching strategy in Government Science and Technical Colleges in Yobe State?

Hypothesis

H₀₁. There is no significant difference between the performance of students taught MVMW Trade using jigsaw, peer and demonstration teaching strategies in Government Science and Technical Colleges in Yobe State.

METHODOLOGY

The study adopted pre-test - post-test non-equivalent quasi-experimental research design,. This design was used because the subjects were not randomly assigned to experimental and control groups. The area of the study is Yobe State. Yobe State was created out of Borno State on 27th August, 1991. Yobe State located between Latitude 12°00'N and 11°13'E of the Greenwich Mediterranean. Yobe State lies within the Northeastern region of Nigeria and occupies a total land area of about 31,000km². The state shared borders with Jigawa and Bauchi to the west, Borno to the east and Gombe to south. Yobe state has 17 Local Government Area that covers 47,153 square km (Bwala, 2019). The population of the study consisted of 197 Students of NTC II Motor Vehicle Mechanic Work in Government Science and Technical Colleges in Yobe State respectively that are offering Motor Vehicle Mechanics Work. A multistage sampling technique was used for this study. Firstly, simple random sampling was used to select three Technical Colleges from the three educational zones in Yobe State. The study also employed purposive sampling technique to assign the experimental and control group which intact classes was used with each of the classes having 22, 26 and 30 students respectively which make a total of 79.

The instrument for the data collection was tagged Motor Vehicle Mechanic Work Performance Test (MVMWPT) adopted from NABTEB past questions papers. The questions were based on a National Board for Technical Education (NBTE, 2004) syllabus for Engineering Trades. The achievement test instrument consists of 50 items multiple choices pre-test which were administered to the students before the treatment in order to ascertain their entry behaviour. The post-test is also the same but the arrangement of the items was changed. The post-test instrument was used to determine the extent to which students had gained knowledge in MVMW. Each correct option was scored 2 marks.

The researcher with the help of three research assistants conducted the study through the following procedures:

Step 1: The researcher visited the sampled Technical Colleges and presents the introductory letters to the Technical Colleges' principals for permission to carry out the research in their respective school.

Step 2: The researcher appointed the research assistants and give them induction training on how to conduct the experiment, which must be of equal qualification and working experience.

Step 3: The researcher and the research assistants administer the pre-test to the MVMW students at the beginning of the research exercise for one week.

Step 4: The researcher and the research assistants administer treatment based on the contents of MVMW topic such as two stroke cycle spark ignition engine and four stroke cycle spark ignition engine. The research assistants taught these contents to both the experimental and control groups for four weeks.

Step 5: The researcher and the research assistants administered the posttest to both the experimental and control group. The results were collected for justification and further analysis for two weeks. The data collected was analyzed using mean, standard deviation and Analysis of Covariance (ANCOVA) with the help of Statistical Package for Social Sciences (SPSS) VERSION 23. Mean and standard deviation was used to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the null hypothesis at 0.05 level of significance. The decision rule was such that; when the P-value is less than or equal to 0.05 the null hypothesis will be rejected but if the P-value is greater than 0.05 the null hypothesis will be accepted. In the decision rule, the researcher used 100% of the total means score of the performance test. As the mean cut-off points shown below: -. In line with NABTEB scoring guide below:

- i. 70-100-A
- ii. 50-59---C
- iii. 40-49---D
- iv. 0-39-----F

RESULTS AND ANALYSIS

Table 1: Mean and Standard Deviation of MVMW Students Taught Using Jig Saw Teaching Strategy

Teaching Methods	Pre test		Post Test		Mean Gain	
	N	(\bar{X})	S.D	(\bar{X})		S.D
Jig Saw Teaching Strategy	22	24.18	5.23	72.18	11.30	47.99

Key: N=Number of Students, (\bar{X})=Mean, S.D=Standard Deviation.

Table 1 showed that the 22 MVMW students taught using jig saw Teaching Strategy yielded a pretest mean scores of 24.18 with a standard deviation of 5.23. While the Posttest mean scores of the MVMW students taught using the Jigsaw Teaching Strategy was 72.18 (Distinction) with corresponding standard deviation of 11.30. The Jigsaw Teaching Strategy had a mean percentage gain of 47.99 after the treatment. This result showed that Motor vehicle Mechanic Work Students performed excellently and even pass at Distinction level when taught using Jigsaw Teaching Strategy. This showed clearly that there is improvement in MVMW students' performance when taught using Jigsaw Teaching Strategy.

Table 2: Mean and Standard Deviation of MVMW Students Taught Using Peer/ Collaboration Teaching Strategy

Teaching Methods	Pre test		Post Test		Mean Gain	
	N	(\bar{X})	S.D	(\bar{X})		S.D
Peer/ Collaboration Teaching Strategy	26	31.04	8.69	66.58	18.77	35.54

Table 2 showed that 26 MVMW students taught using Peer/ Collaboration Teaching Strategy recorded a pretest mean scores of 31.04% with a standard deviation of 8.69 While the posttest mean scores of the 26 MVMW students taught using Peer/collaboration Teaching Strategy was 66.58 (Credit) with a standard deviation of 18.77. The Peer/Collaboration Teaching Strategy had a mean percentage gain of 35.54 after the treatment. This result showed that Motor vehicle Mechanic Work Students performed better when taught using Peer/collaboration Teaching Strategy. This showed clearly that there is also a tremendous improvement in students' performance when taught using Peer/Collaboration Teaching Strategy.

Table 3: Mean and Standard Deviation of MVMW Students Taught Using Demonstration Teaching Strategy

Teaching Methods	Pre test		Post Test		Mean Gain	
	N	(\bar{X})	S.D	(\bar{X})		S.D
Demonstration Teaching Strategy	30	25.50	5.78	30.17	8.37	4.67

Table 3 showed that 30 MVMW students' taught using Demonstration Teaching Strategy (Conventional) had a pretest mean scores of 25.50% with a standard deviation of 5.78 While the posttest mean scores of the 30 MVMW students taught students using Demonstration Teaching Strategy was exactly 30.17 (Fail) with standard deviation of 4.67. The Demonstration Teaching Strategy had a mean percentage gain of 4.67 after the treatment. This result showed that Motor vehicle Mechanic Work Students performed poorly with less improvement when taught using Conventional Teaching method.

Table 4: ANCOVA among the performance of Students Taught MVMW Trade Using Jig Saw, Peer/Collaboration and Demonstration Teaching Strategies in GSTCs in Yobe State

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	32000.557 ^a	3	10666.852	79.366	.000	.763
Intercept	3709.503	1	3709.503	27.600	.000	.272
Pretest	3576.188	1	3576.188	26.609	.000	.264
Teaching methods	26449.521	2	13224.760	98.399	.000	.727
Error	9945.597	74	134.400			
Total	270692.000	78				
Corrected Total	41946.154	77				

a. R Squared = .763 (Adjusted R Squared = .753)

The result in Table 4 shows that $F, (df = 2, 78) = 98.399$, where p value $0.00 < 0.05$. Since the computed p -value 0.000 is less than 0.05 level of significant with a medium effect size (partial eta squared = 0.727). Therefore, the null hypothesis was rejected meaning that, there is significant difference among the performance of students taught MVMW trade using Jig saw, peer/collaboration and demonstration teaching strategies. Hence, Bonferroni multiple comparisons post-hoc analysis was run for comparing and determining the teaching strategies is responsible for the significant difference.

Table 5: Bonferroni Multiple Comparisons Post-hoc Analysis among Jig Saw, Peer/Collaboration and Demonstration Teaching Strategies

(I) Teaching Methods	(J) Teaching Methods	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
					Lower Bound	Upper Bound
Jig Saw	Peer/collaboration	12.606*	3.622	.003	3.733	21.480
	Demonstration	43.361*	3.265	.000	35.364	51.358
Peer/collaboration	Jig Saw	-12.606*	3.622	.003	-21.480	-3.733
	Demonstration	30.755*	3.294	.000	22.685	38.824
Demonstration	Jig Saw	-43.361*	3.265	.000	-51.358	-35.364
	Peer/collaboration	-30.755*	3.294	.000	-38.824	-22.685

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

Table 5 shows the results of Bonferroni Multiple Comparisons post-hoc analysis. The result indicates that jig saw compared with pair/collaboration teaching strategy yielded a mean difference of 12.606^* with a p -value of 0.003 indicating there is significant difference in favour of jig saw teaching strategy against peer/collaboration. In addition, jig saw was compared with demonstration teaching strategy a mean difference of 43.361^* was obtained with a p -value 0.000 indicating there was a significant difference in favour of jig saw teaching strategy against demonstration teaching strategy. Moreover, Pair/collaboration teaching strategy was compared with demonstration teaching strategy a mean difference of 30.755^* was obtained with a p -value 0.000 indicating that there was a significant difference in favour of Peer/collaboration against demonstration teaching strategy.

Finding of the Study

1. Motor vehicle Mechanic Work students taught using the Jigsaw Teaching Strategy had the highest mean scores of Distinction level.
2. Motor vehicle Mechanic Work students taught using Peer/collaboration Teaching Strategy had the subsequent highest mean scores of Credit level.

3. Motor vehicle Mechanic Work students taught using Demonstration Teaching Strategy had the least means scores of Fail level.
4. There is significant difference among the performance of students taught MVMW trade using Jigsaw, peer/collaboration and demonstration teaching strategies with a p- value 0.00 at partial eta squared = 0.727.

FINDINGS AND DISCUSSION

The finding in research question one revealed that Motor vehicle Mechanic Work students taught using the Jigsaw Teaching Strategy had the highest mean scores of distinction level. This finding is in agreement with Ukpoh and Samuel (2021) and Emmanuel and John (2020) who in their various submission revealed that Jigsaw teaching strategy was effective in enhancing the teaching and learning of science subject in Technical Colleges. Specifically, Ojekwu and Ogunleye, (2020) recommended that, Jigsaw teaching strategy should be adopted by Technical Colleges to give student the needed learning pace and growth as the method is individualistic in nature. The finding in research question two revealed that Motor vehicle Mechanic Work students taught using Peer/collaboration Teaching Strategy had the subsequent highest mean scores of Credit level. The finding is in tandem with Iwanger and Muhammed (2019) who reported that peer tutoring instructional strategies used in teaching science students in Katsina State was effective as the students' academic achievement was enhanced. Furthermore, Ngozichukwu and Bamikole (2019) and Chienwattanasook and Jermstittiparsert (2019) submitted that peer tutoring develop the team work attitude in students as the students paired were active and collaborative in the tasks assigned to them. The finding in research question three revealed that Motor vehicle Mechanic Work students taught using Demonstration Teaching Strategy had the least mean scores of Fail level. The finding contradicted the report of Peter (2019) who reported that demonstration method of teaching was effective in teaching Metal work trade students. Peter further stated the reason for the high performance by student by quoting from the Chinese proverb that states: "*I hear – I forget, I see – I remember, I do – I understand*".

CONCLUSION

Based on the result obtained from this research, it has been clearly proven that Jigsaw instructional strategy is more effective in teaching cognitive and psychomotor skill acquisition in Government Science and Technical Colleges in Yobe State at Distinction level than conventional method in improving the cognitive and psychomotor skill acquisition between the experimental and control groups respectively. It also deduced that peer/collaboration improves Motor Vehicle Mechanic Work students' performance at Credit level. This implies that Jigsaw and peer collaboration instructional strategies are viable in improving students' cognitive and psychomotor skill acquisition in Government Science and Technical Colleges in Yobe State.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations were made;

1. Motor Vehicle Mechanic Work trade teachers should be encouraged to adopt the use of Jigsaw and peer/collaboration instructional strategies so that Technical Colleges' graduates could acquire the necessary cognitive and psychomotor skills needed for national development.
2. Government should organized workshop, seminar or conferences on the use of Jigsaw and peer/collaboration instructional strategies in teaching Motor Vehicle Mechanic Work trade for acquiring knowledge and technical skills.
3. National Board for Technical Education (N.B.T.E) should consider in the review of curriculum for National Technical Certificate (NTC) in order to incorporate Jigsaw instructional strategy as method of teaching Motor Vehicle Mechanic Work.

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