

## Collaborative and Demonstration Instructional Strategies and Students' Skills Performance in General Maintenance of Motor Vehicle in Akwa Ibom State Technical Colleges

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### **Abstract**

*The study determined the effect of collaborative and demonstration instructional strategies on students' performance in Motor Vehicle Technology (MVT) in technical colleges in Akwa Ibom State. The skills in motor vehicle maintenance studied are changing engine lubricant and servicing Diesel engines' governor. Two specific objectives, two research questions and hypotheses were stated to guide the study. The study employed the pre-test, post-test, control group quasi experimental research design. The population consisted of 211 senior technical two (ST2) students offering Motor Vehicle Technology (MVT) in public Technical Colleges in Akwa Ibom State. The sample size for the study was 90 ST2 students selected from two intact classes in technical colleges in Akwa Ibom State. Purposive sampling technique was employed for selection of the sample. A researcher-developed instrument of a 100 item multi-choice test titled Motor Vehicle Technology Skills Performance Test (MVTSP) was used for the data collection. Test-retest method was used to ascertain the reliability of the instrument for the study. Pearson Product Moment Correlation (PPMC) was used to determine the reliability of the instrument which gave a value of 0.83. Statistical mean scores were used for answering research questions while analysis of covariance (ANCOVA) was used in testing the null hypotheses at 0.5 level of significance. Findings of the study revealed that there is a significant difference in students' mean performance in changing of lubricant in motor vehicle engine, and servicing Diesel engine's governor when taught using collaborative and demonstration instructional strategies with students in the collaborative method performing better than those in demonstration. It was therefore, concluded that collaborative instructional method is an effective instructional strategy for practical instruction in motor vehicle maintenance. On the basis of the findings, it is recommended among others that heads of schools should encourage their teachers to regularly use collaborative method when teaching students changing engine lubricants and servicing Diesel engine governors.*

**Keywords:** Collaborative, Demonstration, Instruction, Strategies, Performance

### **Introduction**

Motor vehicle is a prime mover of people and goods on land which contributes to daily economic and social system. It comprises of many complex system with a sophisticated group of technological assemble, which include the four essential components of chassis:

incorporates all the major assemblies; engine: source of motive power to the motor vehicle, transmission system: transmits power developed by the engine to the road wheels and the body. Apart from these four essential parts of a vehicle, there are controls and auxiliaries. The controls are meant for controlling the movement of the vehicle. When something is maintained, the idea is to keep it in a good and functional state. Vehicle maintenance refers to a practice where motor vehicle is serviced on a regular basis to prevent a major breakdown or the need for a major repair. Examples of the type of motor vehicle services that may be sought for general maintenance purposes include changing engine lubricant, spark plugs, rotating the tyres, changing brake pads, servicing carburetor, diesel engine's governor, replacing oil filter, air filter, fuel filter, checking the level and refilling brake fluid, clutch fluid (Dye, 2023). Motor vehicle general maintenance procedures are carried out at a set time interval or after the vehicle has travelled a certain distance (Potoski, 2013). Motor Vehicle Technology (MVT) is one of the mechanical engineering trade subjects offered as a career in the Technical Colleges in Akwa Ibom State to provide its graduates with creativity, psycho-productive skills (proficiency in skills execution), knowledge and techniques toward problem-solving in the technological and engineering situations (Nduononwi, 2016). Graduates of MVT need skills, capabilities and attributes in an ever changing global economic environment. Learning motor vehicle general maintenance skills is a matter of learning its component part and integrating them together.

Skills are specialized and well rehearsed method of technique of carrying out a task which would be repeated with predictable quality, efficiency and effectiveness acquired through training, practice and experience. Vampatten and Benati (2020) defined skill as the ability to do rather than underlying competency or representation. Dem *et al.*, (2017) stated that to possess skill is to demonstrate the habit of acting such that the process become natural through repetition of practice. Students' skills performance connotes performance in school subject symbolized by a mark or score on an achievement test or performance in doing something. According to Okechukwu (2018), academic performance of students which include knowledge, skills are ideas acquired and retain through the student's course of study within and outside the classroom situations. In this study, any student who is able to carry out the skills of changing engine lubricant and servicing Diesel engines governor perfectly will be regarded to have high skill performance. It therefore, suffices that, the best way of achieving students' skills performance is through the creation of a teaching atmosphere which challenges and stirs up learners' interest through the use of a good instructional strategy by the teacher (Arido, 2017).

Lubricant or lubricating oil, sometimes referred to as engine oil by non- professional is a generic name for a wide range of products that are characterised by hundreds of base chemicals and additives (Mangas and Vilanova, 2014). It serves as a lubricating substance for keeping important engine parts from grinding against each other and destroying the engine parts and components. Each time the engine runs, the engine lubricant collects by-products

from combustion. If the contaminants continues to build up and goes beyond the capacity of the lubricant, they accumulate and create deposits, sludges and wear in the engine. Where the engine lubricant is not change regularly, these contaminant can have a negative impact on the vehicles overall performance and efficiency (Christophe *et al.*, 2021).

The change should be done every three months or three thousand miles. Also, every engine has a recommendation from the manufacturers that should be followed, the interval can increase between lubricant changes if a driver switches from conventional lubricant to synthetic lubricant.

In a diesel engine, the air sucked inside the cylinder depends upon the breathing characteristics of the cylinders and varies with speed and operating temperature of the engine. Also, likewise the fuel delivered is determined quite independently by the characteristics of the pump which for a fixed control piston may show arising characteristics with speed. The problem of matching these characteristics of engine and pump is difficult where it is necessary to provide for running at varying speeds on a definite acceleration position, hence governors have been designed to meet these conditions (Saif, 2018). In order to maintain the mean speed at all time for normal operation of the engine inspite of load variation, these governors should be inspected, rebuilt, tested and calibrate to manufacturers specifications, overhauls or replaces when necessary (Sethi, 2021). Regular maintenance service is recommended to ensure the optimum operation of governors as follows: routine maintenance or servicing should be carried out yearly or every 6,000 running hours, change fresh air filters every two months; change pressure regulator filters every six months; repair or exchange measuring heed every two years (Machinery spaces.com, 2016).

Collaborative instruction is an educational approach or teaching and learning that involves group of learners working together to solve a problem, complete a task, or create a product (Nduononwi, 2016). Collaborative instructional strategy is the kind of strategy in which learning is shared by groups of students and is not the sole responsibility of the teacher. Laal *et al.*, (2012), observed that there are five basic elements in a collaborative learning environment, namely: positive interdependence, consideration, interaction, individual accountability, social skills and group processing. Holmwood (2017), stated that “collaboration is becoming a measureable skill that teachers are seeking to nurture and provide feedback on”. As a teaching approach which gives the learners an atmosphere of playing active role in the learning process and are made to be excited about the lesson, supporting this progress helps to ensure that MVT students will be productive, effective and influential members of the future workplace.

Demonstration instruction is a strategy for the teaching of concepts, principles or real things by combining explanation with handling or manipulation of real things, exact procedures, equipment or materials. Demonstration is any planned performance by a technical

teacher on an occupational skill aimed at explaining steps of an operation. It is the “showing of how” a process, procedure or an experiment is to be carried out (Akinbobola and Ikitde, 2014). According to Ibiye (2013), demonstration strategy was regarded as the best teaching method, due to its economic nature in terms of time and materials, bridges the gap between theory and practice, enable learners to become good observers while the teachers teach manipulative skills, but it is not enough to subject students of Motor Vehicle Technology (MVT) to mere observation during demonstration process because they may forget. Whereas, students enjoy and understand a lesson more if they are actively involved as opposed to being passive spectators (Ukolor, 2017). This is in line with the Chinese educational paradigm; I hear, I will forget; I see, I will remember; I do, I will understand.

To improve the performance of students in maintenance skills, especially motor vehicle, a more engaging teaching strategy should be employed by teachers. Teaching should be based on the student’s previous knowledge and connection between the experience of students and technological concept. Berkeley (2015) noted that the teacher-centered method does not promotes skill acquisition, objectivity and critical thinking ability among students as there is the need for more activity oriented, students centered and innovative method that can develop in the student’s motor vehicle maintenance skills such as collaborative instructional strategy.

## Statement of the Problem

A practical look at the graduates of Akwa Ibom State Technical Colleges revealed that they do not possess the required level of skills in servicing several parts of motor vehicle which would have made them self-reliance and enterprising in the world of work, due partly to the instructional strategies adopted by teachers to teach in these colleges, whereas, instructional strategies adopted in teaching of practical skills to some extent determine the acquisition of these skills among students. According to NABTEB (2018 and 2020), deficiencies in May/June and November/December examinations involving MVT practical skills in technical colleges in Akwa Ibom State have given rise to serious debate about the quality of technical education training offered to learners for a decade now. The situation of poor performance in motor vehicle technology subjects in both internal and external examinations has attracted the attention of parents, teachers, education administrators, educational planners, stakeholders in education, government, employers of labour as well as researchers who are now advocating for improvement in teaching and learning of skills as well as better performance by MVT students in future examinations.

The intention of MVT programme was to enable its graduates to diagnose, test, maintain and service any fault relating to both early and modern motor vehicle core assembly, units and systems to the manufacturer’s specification. In considering these students' poor performance in public examinations, what easily comes to mind is the method of imparting skills to these students. Attention at this point has been drawn to how these students learn and

what sort of teaching methods, strategies or techniques are being employed by teachers in teaching these skills in the classroom and school workshop. It is against this backdrop that this research is undertaken to determine whether the choice of a particular instructional strategy for the teaching of general maintenance of motor vehicle have implications for a range of factors related to students' ability to acquire these skills, for a gap in knowledge to be filled.

## **Purpose of the Study**

The main purpose of the study was to determine the differences in students' skills performance in General Maintenance of Motor Vehicle in Akwa Ibom State Technical Colleges when taught using collaborative and demonstration learning strategies. Specifically, the study sought to:

- i. determine the difference in students' skills performance in changing of lubricant in an engine when taught with collaborative and demonstration instructional methods.
- ii. determine the difference in students' skills performance in servicing Diesel engines' governor when taught with collaborative and demonstration instructional methods.

## **Research Questions**

This study was designed to provide answers to the following research questions.

- i. What is the difference in students' skills performance in changing of lubricant in an engine when taught using collaborative and demonstration instructional methods?
- ii. What is the difference in students' skills performance in servicing diesel engines' governors when taught using collaborative and demonstration instructional methods?

## **Research Hypotheses**

The following null hypotheses were formulated and tested at 0.05 alpha level.

- i. There is no significant difference in students' skills performance in changing of lubricant in an engine when taught with collaborative and demonstration instructional methods.
- ii. There is no significant difference in students' skills performance in servicing Diesel engines' governor when taught with collaborative and demonstration instructional methods.

## **Methodology**

A quasi-experimental design of intact class size was adopted and given Pre-Test-Treatment-Post-Test measures using a 100-item multichoice test tagged "Motor Vehicle Technology Skills Performance Test" (MVTSP) through their subject teachers. The instrument was validated by 3 experts, two of which was from the department of Industrial Technology Education, Faculty of Vocational Education, Library and Information Science, and one from department of Psychology Foundation Education, Faculty of Education. Test - retest method was used to ascertain the reliability of the instrument for the study. The

population of the study comprised all the 211 Senior Technical Two Students offering Motor Vehicle Technology as a trade subject in the nine public Technical Colleges in Akwa Ibom State. 90 Senior Technical Two (ST2) students from two purposively selected Technical Colleges in Akwa Ibom State, among which were Government Technical College, Ewet, Uyo with 50 respondents as experimental group and Government Technical College, Abak with 40 respondents as control group respectively constituted the sample for the study. The data collected were subjected to analyses using mean in answering research questions while Analysis of Covariance (ANCOVA) was used in testing the null hypotheses at 0.05 level of significance.

## Discussion of Findings

The findings of the study are then discussed under relevant subheadings:

**Research Question 1:** What is the difference in student's skills performance in changing of lubricant in an engine when taught using collaborative and demonstration instructional strategies?

**Table 1: Summary of Mean Difference in Students' Performance in Changing Lubricant in an Engine**

Instructional Approaches	Sample Size (N)	Pre-test Mean	Post-test Mean	Mean Gain	Mean Gain Difference
Collaborative	50	9.46	50.28	40.82	
Demonstration	40	9.75	42.40	32.67	8.15

*Source: Field Data (2023)*

Data presented in Table 1 indicate that for students taught changing of lubricant in an engine using collaborative instructional approach, the mean increases from 9.46 pre-test to 50.28 in post-test. The mean gain is 40.82. For students taught changing of lubricant in an engine, using demonstration approach, the mean increases from 9.75 in pre-test to 42.40 in post-test, giving mean gain of 32.67. The difference in mean gain for students taught with collaborative approach exceeded the mean gain for students taught using demonstration approach by 8.15. It is therefore inferred that collaborative instructional approach enhances students' performance in changing lubricant more than demonstration instructional approach.

**Research Question 2:** What is the difference in student's skills performance in servicing Diesel engine's governor when taught using collaborative and demonstration instructional strategies?

**Table 2: Summary of Mean Difference in Students' Performance in Servicing Diesel Engine Governors**

Instructional Approaches	Sample Size (N)	Pre-test Mean	Post-test Mean	Mean Gain	Mean Gain Difference
Collaborative	50	13.82	38.16	24.34	
Demonstration	40	14.63	31.43	16.8	7.54

*Source: Field Data (2023)*

Data presented in Table 2 indicate that for students taught in servicing diesel engine governors using collaborative instructional approach, the mean increases from 13.82 in pre-test to 38.16 in post-test. The mean gain is 24.34. For students taught servicing diesel engine governors in an engine, using demonstration approach, the mean increases from 14.63 in pre-test to 31.43 in post-test, giving mean gain of 16.8. The difference in mean gain for students taught with collaborative approach exceeded the mean gain for students taught using demonstration approach by 7.54. It is therefore inferred that collaborative instructional approach enhances students' performance in servicing diesel engine governors more than demonstration instructional approach.

**Research Hypothesis I:** There is no significant difference in students' mean performance in changing of lubricant in motor vehicle engine when taught using collaborative and demonstration instructional strategies.

**Table 3: Summary of Analysis of Covariance Test for Significant Mean Difference in Students' Performance in Changing Lubricant**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Model	198414.910 <sup>a</sup>	3	66138.303	370.580	.000
Pretest	100.590	1	100.590	.564	.455
Group	41180.742	2	20590.371	115.370	.001
Error	15527.090	87	178.472		
Total	213942.000	90			

\*Significant at  $p < .05$ .

The result of analysis on Table 3 gives the summary of the Analysis of Covariance (ANCOVA) test. The result shows that the calculated F value is 115.37. The probability of F, that is, the P value is .001. Since the P-value is less than the alpha level of .05, the result is statistically significant. Thus, the null hypothesis is rejected. Hence, there is a significant difference in students' mean performance in changing of lubricant in motor vehicle engine when taught using collaborative and demonstration instructional strategies, with students in the collaboration method performing better than those in demonstration.

**Research Hypothesis 2:** There is no significant difference in students' mean performance in servicing diesel engine's governor when taught using collaborative and demonstration instructional strategies.

**Table 4: Summary of Analysis of Covariance Test for Significant Mean Difference in Students' Performance in Servicing Diesel Engine's Governor**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Model	144507.367 <sup>a</sup>	3	48169.122	195.740	.000
Pretest	1389.862	1	1389.862	5.648	.020
Group	12319.348	2	6159.674	25.030	.001
Error	21409.633	87	246.088		
Total	165917.000	90			

\*Significant at  $p < .05$ .<sup>.001</sup>

The result of analysis on Table 4 gives the summary of the Analysis of Covariance (ANCOVA) test. The result shows that the calculated F value is 25.03. The probability of F, that is, the P value is .001. Since the P-value is less than the alpha level of .05, the result is statistically significant. Thus, the null hypothesis is rejected. Hence, there is a significant difference in students' mean performance in servicing diesel engine's governor when taught using collaborative and demonstration instructional strategies, with students in the collaborative method performing better than those in demonstration method.

### **Implications of the Findings**

The findings of the study have several educational implications to Motor Vehicle Technology teachers and instructors in Akwa Ibom State technical colleges; Principals of Technical Colleges in Akwa Ibom State, the Ministry of Education and the Technical Schools Board. The implication of the findings to Motor Vehicle Technology teachers and instructors in Akwa Ibom State Technical Colleges is that they should endeavor to use collaborative instructional strategy to teach maintenance of motor vehicle particularly, changing of engine lubricant and servicing diesel engine's governor in order to enhance their students' skills performance.

The implication of the findings of the study to Principals of Technical Colleges in Akwa Ibom State is that they should encourage teachers and instructors of Motor Vehicle Technology to henceforth adopt collaborative instructional strategy in teaching servicing and maintenance of motor vehicle. The implication of the findings of the study to the Akwa Ibom State Ministry of Education and Technical Schools Board is that they should enforce the use of collaborative instructional strategy in teaching maintenance of motor vehicle in motor vehicle technology in Akwa Ibom State Technical Colleges.

### **Conclusion**

Based on the findings of the study and discussion, it is concluded that collaborative instructional strategy is an effective method for enhancing students' skills performance in



general maintenance of motor vehicle when taught changing of engine lubricant and servicing Diesel engine's governor in Akwa Ibom State public Technical Colleges. Much more, collaborative method helps students develop teamwork skills, creative and analytical skills, problem solving and other soft skills essential for effective participation in industries.

## Recommendations

Based on the findings of the study, the researcher made the following recommendations:

- i. Motor Vehicle Technology teachers and instructors in all public technical colleges in Akwa Ibom State should henceforth adopt collaborative instructional strategy in teaching changing of engine lubricant and servicing Diesel engine's governor in order to improve students' skills performance.
- ii. The Akwa Ibom State Ministry of Education should recommend and enforce the use of collaborative instructional strategy in teaching of general maintenance of motor vehicle in Motor Vehicle Technology trade subject in all public technical colleges in Akwa Ibom State.
- iii. The Ministry of Education in collaboration with Akwa Ibom State Technical Schools Board should organize retraining programmes for Motor Vehicle Technology teachers and instructors in all Akwa Ibom State public Technical Colleges on how to effectively use collaborative instructional strategy in teaching of practical skills so as to boost the students' skills performance.

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