

## Effect of Problem-Based Instructional Strategy on Students Performance in Auto-Mechanic Works in Edo and Delta States

By

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### Abstract

*The study investigated the effects of problem-based instructional strategy on students' academic performance in auto-mechanic works in Technical Colleges in Edo and Delta States. One research question guided the study and one hypothesis was formulated and tested at 0.05 level of significance. Quasi experimental research design non-randomized control groups were used for the study. The population of the study was 177 Voc. II Auto-mechanic Works students of Government Science and Technical Colleges (GSTC) in Edo and Delta States. A sample of 85 was purposively selected for the study. The instrument for data collection was Auto-Mechanic Achievement Test (AMAT). The instrument was subjected to content validity by three experts, from Department of Vocational and Technical Education. The reliability of the instrument was established by using 20 year II Auto-mechanic Works students. The reliability coefficient of .81 was achieved. Mean ( $\bar{x}$ ) was used to answer the research questions while Analysis of Covariance (ANCOVA) was used to test all the hypotheses at .05 level of significance. Findings reveals that the post-test mean scores of students who were taught Auto-mechanic Works using problem-based instructional strategy was higher than those taught using conventional teaching method in Auto-mechanic Works. Based on these findings, the recommendations were made amongst which is that problem-based instructional strategy should be adopted as instructional strategies in learning Auto Mechanic Works in technical colleges in Edo and Delta States.*

**KeyWords:** Problem Based, Academic Achievement, Instructional Strategy, Conventional Teaching Methods

### Background to the Study

Vocational Education is the education that is designed to prepare both the youths and adults for employment in a specific discipline or occupation. It enables them to develop competencies for employment. Vocational Education can also be seen as the education which provides training and re-training for adults in employment whose skills may have become obsolete, and therefore, updating their skills. Vocational Education is also seen as the part of education which makes an

individual more employable in one group or occupation. Vocational education can be explained in terms of training designed to advance individuals' proficiency in their present or future occupations. It is training or re-training which is given in schools or classes under public supervision and control, provision of systematically trained experience which is redesigned to fit individuals in recognized occupations. Thus, Vocational Education offers courses leading to the acquisition of specific skills to enable one to perform a certain job. It is directed towards the preparation for occupational life since its recipients are equipped to face the world of work (NABTEB) (2010).

Government Science and Technical Colleges (GSTC) are specialized institutions of learning where trades and modular courses in vocational education are offered in addition to general education and science subjects. They are post basic institutions established by Federal and State governments to implement vocational education programmers at that level. The graduates of Government Science and Technical Colleges are expected to be equipped with knowledge, understanding, and skills that would make them employable or self-reliant.

Auto-mechanic Works is one of the trade subjects offered in Technical Colleges. Auto-mechanic is the study of petrol/gasoline engines and compression ignition engines. Amen (2013) stated that the objectives of Auto-mechanic Works include that the graduates of the programme should be able to:

1. diagnose, repair, and maintain a motor vehicle of light and heavy gasoline and diesel power-driven engine.
2. diagnose, maintain, effect repair on electrical component, ignition system, alternators, starters, and batteries
3. diagnose and repair front and rear axles drive, driven component, like belt gear and chain drives

There is the need for an appropriate teaching strategy for the teaching of Auto-mechanic Works that may foster the academic performance of students in Technical Colleges. Most Auto-mechanic teachers in Technical Colleges do constantly face the decision on how to design instruction, which will meet the needs of the students. As technology is changing, the teaching of Auto-mechanic Works must change with the technology so that the level of students thinking in dealing with various diagnoses, repair, and maintenance of motor vehicles would be commensurate with the maintenance needs of today's Automobile. In other words, students need to be equipped with high-order thinking skills for easy adaptability. Campbell (2010) stated that traditional teaching methods

do not adequately equip teachers with contemporary views of students' intelligence and their vast learning capabilities. The National Business and Technical Education Board (NABTEB) May/June Chief Examiner's Report (2010) indicated that the shortcoming of the present teaching method partly accounted for the poor performance of students in Auto-mechanic Works in the National Technical Certificate Examination in recent years. According to (NABTEB) 2010, the performance of students in National Technical Certificate (NTC) Examination was poor; the report indicated that the level of student's performance in Auto-mechanic subjects was lower than expected, as most students scored less than 50 percent in the subject. This poor performance could be attributed to the traditional method of teaching adopted to rather than using the modern teaching method by Auto-mechanic teachers in the Technical Colleges while teaching petrol engines in the classroom.

The peculiarity of Auto-mechanic Works is that the concepts are so abstract that students find them difficult to comprehend and concretize. Therefore, if the stated objectives must be achieved for students to perform well in their certificate examination and demonstrate acquired knowledge and skills in employment, they must be adequately equipped with the modern way of teaching Auto-mechanic Works theoretically and practically. With the continued use of the conventional teaching method, where the teacher uses the chalkboard and textbooks as the teaching aids; the teacher is thus, the active participant in the class, while the students are mere observers who watch the teacher. Asogwa (2011) posited that the conventional teaching method encourages laziness, rote memorization and could eventually kill students' interest and attitude towards the subject. The need to use a teaching method that can enhance the academic performance of Auto-mechanic students is very important. The researcher hopes that using the Problem-Based and Jigsaw Instructional Strategies may help to enhance and improve the academic performance of students of Auto-mechanics works in Technical Colleges in Edo and Delta States.

To realize the objective that is needed to enhance the Academic Performance of Auto-mechanics students, there is the need for the use of the modern instructional method. One of the instructional methods is the Problem-Based (PB) Instructional Strategy. In this instructional strategy, the students are the main drivers of learning while the teacher acts as the facilitator of the learning process. The PB process is hinged on the students being able to research a problem and come up with solutions, with the teacher guiding and facilitating the process. Problem-Based learning is dependent on the students getting involved and directing their learning. The facilitator of the PB

group is not there to give answers, but rather to ask pointed questions, to stimulate students thinking, to draw on their knowledge, and to guide the appropriate resources.

Problem-Based Instructional Strategy is a student-centered teaching method that begins with the assumption that learning involves an active, integrated, and constructed process (Hay, 2011). It means that this method of teaching involves students' active participation and social interaction of students in the group such that individual students can construct knowledge and skills. That is, students: must learn to be conscious of what information they already know about the problem, what information they need to know to solve the problem, and the strategies to use to solve the problem. This process of learning will create in the students' the skills that would make them become problem-solvers and learn independently. The role of the teacher is to guide the students as they work in groups. The use of PB could be very effective for teaching since it involves practical exercises in the workshop.

Problem-Based Instructional Strategy can also be seen as a method of learning and teaching which allows students to focus on how and what they will learn when a situation or task is presented to the students and they are required to determine for themselves how they will go about solving the problem. This usually occurs through small group work and allows students to utilize their prior knowledge in the topic area and identify the gap in their knowledge as they attempt to solve the problem. PB is a student-centered approach to learning that encourages students to be self-directed, interdependent, and independent as they attempt to solve a set of problems. In PB, rather than teaching relevant material and subsequently having students apply the knowledge to solve problems, the problem is presented first.

Students' performance in a school subject is symbolized by scores or marks on an achievement test. Students performance can also represent the performance outcome of students that indicates the extent to which he or she has accomplished specific goals that were the focus of activities in instructional environments, specifically in schools like Technical Colleges. School systems mostly define cognitive goals that either apply across multiple subject areas like critical thinking or include the acquisition of knowledge and understanding in a specific intellectual domain. Therefore, students' performance is considered a multifaceted construct that comprises different domains of learning. The definition of students' performance solely depends on the indicator used to measure it. Students' performance is the criteria used in determining the grades or performance on an educational achievement test. It is also a cumulative indicator of students' performance such

as educational degree and certification with Technical Colleges inclusive. Based on these, the researcher is determining to investigate the Effect of Problem-Based Instructional Strategy on the Students Performance of Auto-mechanics Works Students in Technical Colleges in Edo and Delta States.

### **Statement of the Problem**

Many students find it difficult to study Auto-mechanics Works because they see the engine as being complicated. Those students who eventually study Auto-mechanics in the Technical Colleges do not perform well in National Business and Technical Education Board (NABTEB) examinations (Okoye, 2010). The National Business and Technical Education Board (NABTEB) May/June Chief Examiners Report (2010) indicated that the shortcomings of the present method of teaching partly accounted for the poor performance of students in Auto-mechanic in the Technical Colleges Examination in recent years. The report also showed that the level of achievement in Auto- mechanic subjects was lower than expected as most students score less than 50 percent in these subjects. Okoye (2011) identified lack of good methodology as the major reason for low achievement and drop outs in the Technical Colleges. NABTEB (2012), the performance of students in National Technical Certificate (NTC) Examination was poor. Amen (2013) observed that the low level of achievement has been attributed to certain factors, which are inadequate qualified Auto-mechanics teachers; lack of student's interest; non-exposure to field trips; non-inclusion of Technical College Students in Students' Industrial Work Experience Scheme (SIWES), and above all poor method of teaching.

These indicated that the level of students' performance of Auto-Mechanic Students is on the decline and less than 40 percent passed. The implication of this to the nation's economy is that it will impede development, and therefore, the problem of this study is the low and receding performance of students in Auto-Mechanic Works. It is against this background that this study seeks to determine the effect of Problem-Based and Jigsaw Instructional Strategies on Students Performance in Auto-Mechanic Works in Technical Colleges in Edo and Delta State.

### **Method of Study**

Quasi-experimental research design was adopted for this study. Specifically, the researcher adopted the non- randomized control group design which involved two groups (experimental 1 and

control). The schools assigned experiment 1 and control group, had more male and female students offering Auto-mechanic Works. This design is considered suitable for the study because there was no room for randomization. Therefore, intact classes were used to avoid disruption of normal class lesson.

Akuezuillo (2018) posited that in the school setting, it is not always possible to use true experimental research design in conducting educational research. This is because the school authorities may not allow the control or manipulation of intervening variables that might affect the result of the research study such as equating the two groups by assigning students to experimental and control groups.

## Results

The results of the analysis are presented according to the order of the research question and hypotheses that guided the study. The research questions were answered and hypotheses tested with proper inferences.

Presentation Question 1: Is there any difference between pre- test and posttest of student taught Auto-mechanic works using problem based instruction strategy and the conventional teaching method in technical colleges in Edo and Delta State?

**Table 1: The Pretest and Posttest mean Scores of Students Taught Auto- mechanic Works using Problem-Based Instructional Strategy and Conventional Teaching Method**

Treatment Method	N	Pre-Test Mean Score	Post-Test Mean Score	SD
PB	35	32.89	65.54	11.1
CTM	25	30.80	46.40	7.02
Difference			19.14	

Source: Field Study 2020

Results presented in Table 1, show a pre-test and post-test of students' taught Auto-mechanic Works using Problem-based Instructional Strategy and conventional teaching method in Technical Colleges in Edo and Delta State. The pre-test and post-test mean scores of students

exposed to problem-based instructional strategy was 32.89 with a standard deviation of 11.1. The post-test mean score was 65.54, indicating a difference of 19.14. While, the pre-test and post-test mean scores of students exposed using conventional teaching method was 30.80 and 46.40 respectively, with standard deviation of 7.02. This analysis shows that problem-based instructional strategy had the higher mean than the conventional teaching method in technical colleges in Edo and Delta States

**Table 2: ANCOVA table for test of Difference Between Variables: Problem Based and Conventional Method with Interaction Effect of the Treatment by Sex**

SOURCE OF VARIATION	TYPE III SUM OF SQUARE	DF	MEAN SQUARE	Fr	SIG
Corrected model	17505.187	5	3501.937	48.084	.000
Intercept	9675.229	1	9675.229	132.881	.000
Pretest (Covariate)	4518.496	1	4518.496	62.658	.000
<b>Instructional Strategies:</b>					
PROBLEM BASED*	6163.091	1	6163.091	*85.824	.000
CONV. METHOD*	5407.034	1	5407.034	*74.261	.000
PB* CM*	12986.691	2	6493.346	*89.180	.000
<b>Interaction Effect:</b>					
PB* CM	322.007	2	161.003	*2.211	.746
Error	5388.001	74	72.811		
Total	289121.000	85			
Corrected total	22893.187	79			

R Squared = .746 (Adjusted R Squared = .739)

### Interpretation of Results

#### Pre-test and Post-test of Problem-based Instructional Strategy and Conventional Teaching Method

Hypothesis 1: There is no significant difference between the Pre-test and Post-test score of Students taught Auto Mechanics Works using Problem-Based Instructional Strategy and Conventional Teaching Method in Edo and Delta States.

Table 2 indicates that F ratio of 85.824 for Problem-based Instructional Strategy at .000 level of significant. Thus, the null hypothesis was rejected. This implied that the alternate hypothesis of a significant difference between post-test mean score of students taught auto-mechanic works with Problem-based Instructional Strategy and those taught auto-mechanic works with conventional teaching method was retained.



## Discussion of Findings

The findings from this study revealed that instructional methods had a significant effect on the performance of students. The results showed that, students who were taught Auto-mechanic Works using problem-based instructional strategy performed higher in post-test mean scores than those taught using the conventional teaching method. From this study, there was a difference in the performance Mean scores of students taught with problem-based instructional strategy and those taught with the conventional method. The findings of the study are in agreement with the findings of Johnson, Johnson (2015); Eghbal and Sima (2014) who found that problem-based instructional strategy had significant effect on the post-test academic achievement scores of students than the conventional teaching method. The findings of study are also in consonance with the finding of Duyilemi (2015), who conducted research on the effects of problem-based teaching method and conventional lecture methods on the achievement of Senior Secondary School Students in biological taxonomy. The study found that students taught with problem-based teaching method achieved significantly higher than those taught with conventional lecture method. The findings of this study are also in line with the finding of Osuyi (2021), who carry out a study tittle the effects of the Problem-Based Teaching Method (PBTM) on students' academic achievement in basic technology. The finding revealed that students taught basic technology with problem-based teaching methods performed better in their post-test mean scores than those taught with the conventional teaching method. Also, the finding indicated that the problem-based teaching method was more effective in enhancing the academic achievement of male and female students in basic technology. The findings of this study is also in agreement with the study of Hooker (2011) who carried out a study on the use of a Problem-based learning groups in developmental Mathematics classes to change the students' perceptions of mathematics and their success, the results show that there was an 80% increase in student completion rate compared to the control group. The findings of this study is also in agreement with the findings of Mkpama (2018) who carried out a study titled effects of using the class-wide problem-based and jigsaw teaching method on students mathematical problem-solving performance in elementary concepts in physics, the findings show that students taught with class-wide problem-based strategy performed significantly higher than students taught with jigsaw teaching method and the conventional teaching method. Similarly, Nnorom (2019); Bukari and Asiedu-Addo (2019) found that students taught using problem-based instructional



strategy performed significantly better than those taught using conventional teaching method which supported the finding of this study. The findings of the study are also in agreement with the findings of Majoka, Khan and Shah (2011) in their studies titled impact of Problem-based learning group and conventional teaching method on social studies, the study revealed that students taught social studies with problem-based learning groups performed significantly better than the conventional learning groups. The findings of this study is also in agreement with the finding of Nur (2015) who examined the effect of problem-based cooperative learning method on students' performance in the general certificate of education advanced level psychology, the result show that students taught psychology using problem-based teaching method performed significantly better after an interaction. The findings of this study is in consonance with Uygun and Tertemiz (2014); Espinoza and Sanchez (2014); Olpak, Balkaci and Arican (2018) who attested that problem-based instructional strategy students performed better than the conventional teaching method. The findings of this study also concur with the findings of Ebrahim (2016) in his study comparing the effect of teacher centered learning and problem-based collaborative learning the posttest was higher in the experimental group over the control group. The findings also coincide with the findings of Martins and Oyebanji (2015) who examined the effects of problem-based and conventional teaching methods on the cognitive achievement of integrated science students. The study revealed that students who were taught by using the problem-based method performed significantly better than those taught using conventional teaching method. The result of this study is also in line with Aidoo, Boating, Klssi and Ofori (2015) who found out that students taught chemistry with problem-based learning perform better than those students taught with conventional teaching method. Finally, the findings disagreed with the findings of Dalrymple (2016) who found no significant improvement in GPA grades of students as regards to the amount of group studying the subject.

## Conclusion

In this study, it was found that problem-based and jigsaw instructional strategies had more positive effects on students' academic performance. This implies that problem-based and jigsaw instructional strategies are very effective in the teaching of Auto-mechanic Works. These strategies give students the opportunity to practice what they have learned to enhance their understanding while gaining one-on-one attention and discussion. In addition, these strategies enhance students' performance across all levels of cognitive and psychomotor domains, thus

establishing the efficacy in bridging the performance gaps among learners of various leaning abilities. Therefore, problem-based instructional strategy could be used in the teaching and learning of Auto-mechanic Works to enhance students' academic performance and mastery of knowledge and skills in Auto-mechanic Works.

### Recommendations

From the findings of the study, the following recommendations were made:

- a) Auto-mechanic Works teachers in Government Science and Technical Colleges (GSTC) should use Problem-based instructional strategy in the teaching of Auto Mechanic Works to enhance students' performance.
- b) Government should provide training for teachers of auto mechanics on the use of Problem-based teaching strategy.
- c) Government Science and Technical College administrators should provide instructional facilities for using PB instructional strategy. Also, Auto-mechanic Works teachers should be given opportunities for in-service training to equip them with the skills required in the use of PB and jigsaw instructional strategies for teaching Auto-mechanic Works.

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