Effects of Classroom Interactive Pattern on Student's Academic Achievement on Motor Vehicle Mechanics Work Students' in Government Science and Technical Colleges of Adamawa State

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Abstract: *This study found out the Effects of Classroom Interactive Pattern on Student's Academic Achievement on Motor Vehicle Mechanics Work Students' in Government Science and Technical Colleges of Adamawa State four research questions, four purpose of study were formulated to guide the researcher during the study process. Two hypotheses were formulated and tested at 0.05 level of significance. The population of the study were 91 NTC II Students from the two Government Science and Technical Colleges. The study was carried out in Adamawa State, Nigeria. The design used for the study was non-equivalent, control group, pretest posttest quasi experimental design. The schools were assigned to control group and experimental groups. Four topics were selected from the motor vehicle mechanics work NTC II syllabus of National Business and Technical Education Board (NABTEB) Curriculum for the treatment. The instrument for data collection was selected NABTEB-NTC examination questions tagged Motor Vehicle Mechanics Works Service Station Test (MVMWSST). The data generated from this study was analyzed using a Statistical Package for Social Sciences (SPSS) The mean was used to answer the research questions while Analysis of variance (ANOVA)and Analysis of Covariance (ANCOVA) were used to test the null hypotheses at 0.05 level of significance. Therefore, the formulated hypothesis was accepted based on the result of the pretest and posttest. These indicate that the Teacher-to-Students and Student-to-Students interactive teaching strategies of learning has more effect on students' academic achievement of MVMW students. The result showed that there is an achievement in the posttest means score for the groups It was therefore recommended that Teacher-to-Students and Student-to-Students interactive teaching strategies should be adopted as teaching strategies for MVM at technical colleges in Adamawa State, National Board for Technical Education (NBTE) should recommend Student-to-students interactive teaching strategies at technical college level.*

Keywords: *interactive classroom pattern academic achievement*

Background

Automobile mechanics trade programmes in technical colleges involve the application of scientific knowledge in the design, selection of materials, construction, operation and maintenance of automobiles. It is a mechanical trade offered as Motor Vehicle Mechanics Work (MVMW) trade in Nigeria Technical Colleges. Motor Vehicle Mechanics Work trade programme in Nigerian technical college was planned to produce craftsmen and master craftsmen who should be competent and skillful to carryout routine services and repair of all types of vehicles (National Board for Technical Education, NBTE, 2019). The trade involves repairs and maintenance of brake, transmission, engine, fuel, cooling and lubrication systems of a vehicle. According NBTE (2019), an auto mechanics craftsman is expected to test, diagnose, service and completely repair any fault relating to the conventional automobile assembly main units and systems to the manufacturers' specifications. The requirements of these tasks demand a high-quality instructional strategy to be used to improve auto mechanics instruction as well. To meet up with modern world challenges there is need to give technical college student the capabilities to interact with different level of instruction using ICT to enable them exploit their immediate environment and work toward integration of new technology in the Nigerian educational system. In addition, it also appears Nigerian technical colleges are making too little efforts to ensure their students are conversant with the use of computer-based technology. Information and communication technologies drive the new economy and have made knowledge a competitive resource. The need for recurrent education and the changing labour market conditions, call for flexible access to Technical and Vocational Education and Training (TVET). The requirement necessitates the need to seek for a high-quality instructional strategy. Ugochukwu, *et al.,* (2019) pointed out that the use of appropriate strategy for teaching auto-mechanics in Technical Colleges which is capable of enhancing student's optimal learning is currently the focus among vocational and technical educators in the global world. In Nigeria, the time has come to ensure that the pedagogical approach to the teaching and learning of auto-mechanics, is the types that will guarantee attainable high performance in the subject (that is, the techniques that enable the students to proficiently acquire, adapt, apply, and transfer skills to different contexts under varying technological conditions) as obtained in developed world. In short, the quality of instruction in Nigerian Technical Colleges must keep pace with the development of new trends in exploring the potential of Intelligent Teacher (Raja & Nagasubramani, 2018). Auto-mechanics technology teachers use various pedagogical techniques such as lecture, demonstration, discussion, and questioning in teaching MVMW trade under the auspices of a school system.

The teacher-to- student interactive teaching and learning will empower teacher learner to promote change and raise the development of the 21st century skills. The teacher's students learning strategy incorporate the use of model technology into their learning environment. Tapscott (1998) defined interactive learning as a pedagogical approach that incorporate social networking and urban computing into course design and delivery, it has emerged as a result of the widespread use of digital technology and virtual communication. According to Senthamarai (2018), the teacher student Interactive learning help students strengthen problem solving and critical thinking skill. Senthamarai (2018) and Khandve (2015) asserted that interactive

instructional strategies provide opportunities for student to strengthen their observation skill, listening skills, communication skills and interpersonal skills.

Student-to-student interactive learning fosters interdependency amongst learners for successful learning. Therefore, teaching students how to communicate effectively, work together with others and engage in self-learning has become the basics of education (Chih-Hsiang, *et al.,* 2013). Many Asian countries have been put under pressures to carry out a series of educational reforms. The focus of these reforms shows that Western teaching and learning approaches such as student-centered learning, team work, and especially Student-to-Students interactive learning have become priority in Asian education institutions (Chih-Hsiang, *et al.,* 2013). The increasing adoption of such approaches comes from a belief among Asian educational authorities that borrowing modern (Western) philosophies and practices would mean taking advantage of the forerunners, making a huge leap by skipping the painfully long research stage (Baliya, 2013). This also target at improving students' performance and a better way of impacting knowledge and its processes.

Demonstration method of instruction is that teaching method that involves gestures, physical activity and the oral presentation between the teacher and the students. Cyril (2013) defined demonstration method of teaching as teaching method that involves the arrangement of materials, tools and equipment to show students how an operation is performed. The method deals with practical step-by-step performance of a procedure, with a detailed explanation accompanying each step. Demonstration method engages the learners to practice the activity or skill being demonstrated for reinforcement and retention (Enemali, 2010). It is the method used to teach concepts, principles or real things by combining explanation with handling or manipulation of real things, equipment or materials (David, *et al.,* 2012). Classify demonstration method of instruction into psychomotor development methods.

Ajaja and Eravwoke (2010) defined academic achievement as the outcome of education, the extent to which students, teachers or institution achieve their educational goal. Academic achievement is commonly measured by examination. The most common achievement test is a standardized test developed to measure skill and knowledge of the learner using a given grade. There has been public complain of poor academic achievement among Technical College students in recent times especially the academic achievement of students in Motor Vehicle Mechanics Work (MVMW) in NABTEB Examination.

Hai-Long, *et al.,* (2022) studied the Influence of teacher–Student Interaction on the Effects of Online Learning: Based on a Serial Mediating Model. The results indicate that teacher–student interaction not only directly affects students' learning effects but also influences students' learning effects through the mediating effect of the psychological atmosphere and learning engagement. Okoye, and Onwuachu (2018) carried out investigated on the influence of classroom interaction patterns on achievement in biology among Senior Secondary School Students in Anambra State. Result showed among others that classroom interaction patterns significantly influenced students' achievement in biology. Kadir and Ercan (2018) examined the effect of mobile learning applications on undergraduate students' academic achievement, attitudes toward mobile learning and animation development levels. The findings suggest that mobile learning may promote students' academic achievement. Both groups had significantly high attitude scores toward mobile learning. Furthermore, the students appreciated mobile learning

as an approach that may significantly increase their motivation. Researchers and practitioners should take into consideration that mobile learning can create positive impact on academic achievement and performance and increase the motivation of students. Darakhshan and Muslim (2016) Evaluates the effect of audio-video interactive session between the students and teachers on the students' academic performances in e-learning universities/institutes in Pakistan. It is observed that Team viewer and Skype sessions between the students and teachers have a positive impact on the students' academic performances in e-learning universities/institutes. Therefore, it is suggested to encourage the Team viewer/Skype and other interactive session between students and teachers in e-learning institutes of Pakistan.

Muhammad, *eta al.,* (2018). Studied the effects of using interactive whiteboards on the achievement of higher secondary students in respect of English vocabulary teaching were examined. Findings and results disclosed that the experimental group outperformed the control group with respect to their achievements. The IWB appeared to have significant effects on the achievements of students for learning English vocabulary on higher secondary students. Liaqat, *et al.,* (2011) investigating "The effects of classroom interaction on students' academic achievement at secondary school level. It is recommended that teachers should adopt interactive learning style in their classrooms because it actively engages students in the learning process. Teachers may be provided support so that they may implement various interactive activities in the classrooms. Ochogba, *et al.,* (2019) the effect of demonstration method on student's academic performance in Basic Technology in secondary schools in Rivers State. The study found that students taught with demonstration method did better than those taught with lecture method. Furthermore, the study found that there was a significant difference in the mean score of students taught with demonstration method and those taught with lecture method in the production of wood and metal. Ehiwario, *et al.,* (2019**)** examined the effects of demonstration instruction method of teaching Mathematics on the achievement of secondary students in the study area. The result of the study shows that: there exists significant difference in the learning outcome of students taught with demonstration and those taught with lecture methods of instruction (in favour of those with demonstration). It was also revealed that there is no significant difference in the academic achievement of male and female students that were taught with demonstration method.

Statement of the Problem

The use of the effective instructional method in technical colleges will enhance students' academic achievement. This demands that teachers in technical colleges should adopt instructional methods that would improve the academic achievement of students in auto mechanics technology in technical colleges. According to Bulgarian Comparative Education Society (2021), educational systems around the world are under increasing pressure to use the new technologies to teach students the knowledge and skills they need in the 21st century. Many countries are engaged in a number of efforts to effect changes in the teaching and learning process to prepare students for an information and technology-based society. The report showed that the level of achievement in MVMW subject was lower than the expected average as most of the students score less than 50% in the subject. This lower achievement may be due to the methodology of teaching employed by the MVMV teachers in Technical Colleges. (Atsumbe, *et al.,* 2012).

Idris (2013) also reported that student achievement in MVMW is poor due to short coming in teaching. Peter (2014) reported also that there is high rate of failure among auto mechanics students in technical college due to un- motivating and unchallenging methods and approach used by their teachers. Kumazhege (2016) as citied Musa, *et al.,* (2019), also reasoned that such as excessive use of lecture method; lack of improved instructional methods and lack of student's interest in learning are reasons for the deteriorating status of students' performances in the trades. If this situation is allowed to continue unchecked, the objectives of TVET, as enshrined in National Policy on Education on the students of engineering trades was negatively affected. The attitude of students, parents, and society at large towards engineering trades will not be achieved

Inspite the support from various body such as the government and non - governmental organization there are still poor academic achievement among students of motor vehicle mechanics work at technical colleges in Adamawa state. Enoch (2016) accredited the poor academic performance on the instructional methodologies and strategies employed by the teachers. It is on these reports experience that the researcher wants to look at the effects of interactive teaching and learning strategies on motor vehicle mechanic work students' academic achievement, interest and retention of government science and technical colleges of Adamawa state.

Purpose of the Study

The purpose of the study is to determine the effects of classroom interactive pattern on student's academic achievement on motor vehicle mechanics work students' in government science and technical colleges of Adamawa State. Specifically, the study sought to:-

i. Find the mean difference in the pre-test score of Motor Vehicle Mechanics Work students in teacher-to students, student-to-students interactive teaching strategy and demonstration teaching method group.
ii. Determine the academic achievement of Motor Vehicle Mechanics Work students when taught using teacher-to-students and student-to-students interactive teaching strategies
iii. Determine the academic achievement of Motor Vehicle Mechanics Work students when taught using teacher-to-students interactive teaching strategy and demonstration teaching method group.
iv. Determine the academic achievement of Motor Vehicle Mechanics Work students when taught using student-to-students interactive teaching strategy and Demonstration teaching method strategy

Research Question

1. What is the mean difference in the pre-test score of Motor Vehicle Mechanics Work students in teacher-to students, student-to-students interactive teaching strategy and demonstration teaching method group?

2. What is the academic achievement of Motor Vehicle Mechanics Work students when taught using teacher-to-students and student-to-students interactive teaching strategies?

3 What is the academic achievement of Motor Vehicle Mechanics Work students when taught using teacher-to-students interactive teaching strategy and demonstration teaching method group?

4. What is the academic achievement of Motor Vehicle Mechanics Work students when taught using student-to-student interactive teaching strategy and Demonstration teaching method strategy?

Hypotheses

The null hypotheses that guide the study were tested at 0.05 level of significance

H_{01}: There is no significant difference in the pre-test Mean academic achievement score of motor vehicle mechanics works student in Teacher- to- students, Student -to- students' interactive teaching strategy and Demonstration teaching method

H_{02}: There is no significant difference in the post-test Mean academic achievement score of motor vehicle mechanics works student in teacher- to- students, student -to- students' interactive teaching strategy and Demonstration teaching method.

Methodology

The study was carried out in Adamawa State which is located in North Eastern Nigeria. Adamawa State has a total area of 39,742.12 sq. Km and Lies between latitude 7^0N and 11^0N and longitude $11^050'$ E and $14^050'$ E, (Adebayo & Tukur, 1999). Adamawa State has three Government Science and Technical Colleges (GSTC), and one Federal Science and Technical College (FSTC)The population of the study consist of 91 students of Motor Vehicle Mechanic Works (MVMW) NTC 2 students enrolled in 2022/2023 academic session in Government Science and Technical College, Yola, Government Science and Technical College, Mubi, and Government Science and Technical College, Numan respectively. The research design for this study was the non–equivalent control group, pretest-posttest quasi-experimental design. This design was adopted because the experiment was carried out using intact-classes. Intact-classes was used to avoid disruption of normal classes. For this reason, there was no randomization of pupils into experimental and control groups. This research design assesses equivalency of groups, compare the groups and measures the degree of changes that occur as a result of treatments or interventions. Hence the design exposes the relationship among variables (UNICEF, 2014).Purposive sampling technique was used to select the three technical colleges in Adamawa State for the study. The instrument for data collection was selected from 2010 to 2021 NABTEB-NTC examination questions tagged Motor Vehicle Mechanics Works Service Station Test (MVMWSST). The instrument consist of 40 multiple choice questions, each question has four answer options lettered A-D. Each question with 2.5 marks, Data collected for this study were analysed as follows: Mean statistics were used to answer all the research questions while; the null hypotheses were Analysis of Covariance (ANCOVA) at 0. 05 level of significance.

To answer the research questions of the study, both pre-test and post-test mean scores of experimental and control groups were compared for Mean difference. Higher Mean score showed better achievements respectively. The decision for testing the two null hypotheses of the study was that; when the calculated ANCOVA was lower than the p-value, the null hypothesis was accepted, conversely, the null hypothesis was rejected

Results

The result of the study is presented based on the research question and the hypotheses used in the study.

Research question 1: What is the mean difference in the pre-test score of Motor Vehicle Mechanics Work students in teacher-to-student, student-to-students interactive teaching strategy and demonstration teaching method groups?

The data that provided the answer to this research question were analyzed and presented in Table 1

Table 1: Mean Achievement Score Level of MVMW Students At Pre-test Treatment

Teaching Strategies	N	Academic Achievement		
		$\bar{x}$	σ	Rmk
Teacher to students Strategy	24	29.67	5.84	Fail
Students to student Strategy	35	28.71	6.41	Fail
Demonstration method	32	29.81	7.12	Fail

$\bar{x}$ = Mean, σ = Standard Deviation, N = Number of Students, Rmk = Remark

Table 1 shows the pre-test academic achievement Mean scores level of students in Teacher-to-Students, Student-to-Students interactive teaching strategy and Demonstration teaching method before administration of treatment. The Mean achievements scores for both the groups were 29.75, 28.70 and 29.78 respectively. This shows that the three groups were almost equivalent in their academic achievement.

Research Question 2: What is the academic achievement of Motor Vehicle Mechanics Work students when taught using teacher-to-students and student-to-students interactive teaching strategies?

Table 2: Achievement Score for Teacher-To-Students and Student-To-Students Interactive Teaching Strategy

Teaching Strategies	Teacher to student's Strategy				Student to student's Strategy			
	N	$\bar{x}$	σ	Remark	N	$\bar{x}$	σ	Remark
Pre-Test	24	29.67	5.84	F	35	28.71	6.41	F
Post-Test	24	72.88	11.57	A	35	74.57	11.81	A
Mean Gain		43.21				45.86		

$\bar{x}$ = Mean, σ = Standard Deviation, N = Number of Students, Mean Gain = Post-Test Minus Pre-test, Remark= A =Distinction, C = Credit, P = Pass. F= Fail

Table 2 revealed academic achievement of teacher-to-student and student-to-students interactive teaching strategies had a Mean score of 29.67 at pre-test, 72.88 at post- test, Mean Gain 43.21 and Mean score of 28.71 at pre-test, 74.57 at post- test, Mean Gain 45.86 respectively. The results these have shown that student-to-students interactive teaching strategy had achievement more than teacher-to-student interactive teaching strategy

Research question 3: What is the academic achievement of Motor Vehicle Mechanics Work students when taught using teacher-to-students interactive teaching strategy and demonstration teaching method group?

Table 3: Achievement Score for Teacher-To-Students Interactive Teaching Strategy and demonstration teaching method group?

Teaching Strategies	Teacher to student's Strategy				Demonstration Method			
	N	$\bar{x}$	Σ	Remark	N	$\bar{x}$	Σ	Remark
Pre-Test	24	29.67	5.84	F	32	29.81	7.12	F
Post-Test	24	72.88	11.57	A	32	72.78	13.67	A
Mean Gain		43.21				42.97		

$\bar{x}$ = Mean, σ = Standard Deviation, N = Number of Students, Mean Gain = Post-Test Minus Pre-test, Remark= A =Distinction, C = Credit, P = Pass. F= Fail

Table 3 revealed academic achievement of the teacher-to-student interactive teaching strategy and Demonstration method had a Mean score of 29.67 on the pre-test, 72.88 on the post-test, a Mean Gain of 43.21 and a Mean score of 29.81 on the pre-test, 72.78 at post-test, Mean Gain 42.97 respectively. The results have shown that the teacher-to-student interactive teaching strategy had achieved more than the Demonstration method.

Research Question 4: What is the academic achievement of Motor Vehicle Mechanics Work students when taught using student-to-student interactive teaching strategy and Demonstration teaching method strategy?

Table 4: Achievement Score for Student-To-Students Interactive Teaching Strategy and Demonstration Teaching Method Group

Teaching Strategies	Student to student's Strategy				Demonstration Method			
	N	$\bar{x}$	σ	Remark	N	$\bar{x}$	σ	Remark
Pre-Test	35	28.71	6.41	F	32	29.81	7.12	F
Post-Test	35	74.57	11.81	A	32	72.78	13.67	A
Mean Gain		45.86				42.97		

$\bar{x}$ = Mean, σ = Standard Deviation, N = Number of Students, Mean Gain = Post-Test Minus Pre-test, Remark= A =Distinction, C = Credit, P = Pass. F= Fail

Table 4 revealed academic achievement of the student-to-student interactive teaching strategy Mean score of 28.71 on the pre-test, 74.57 on the post-test, a Mean Gain of 45.86 and the Demonstration method had a Mean score of 29.67 on the pre-test, 72.88 at post-test, Mean Gain 43.21 respectively. Comparing the results these have shown that the student-to-student interactive teaching strategy had achieved more than the Demonstration method

Hypothesis 1: There is no significant difference in the pre-test Mean academic achievement score of motor vehicle mechanics works student in Teacher- to- students, Student -to-students interactive teaching strategies, and Demonstration teaching method

The data that provided the answer to this research question were analyzed and presented in Table 5

Table 5: Analysis of Variance (ANOVA) of Mean Achievement Score of MVMW Students at Pre-Test Treatment

Source of variance	Sum of square	Df	Mean of square	F	p-valve	Decision
Between group	23.397	2	11.698			
				0.28	0.76	Accept
Within group	3749.331	88	42.602			
Total	**3772.747**	**90**				

Table 5 presents the data that was used to test the hypothesis and were analyzed using Analysis of Variance. The ANOVA value for F was 0.28 and the p-value of 0.76 therefore the null hypothesis was accepted. These show that there is no significant difference in the Mean achievement score of MVMW students. These indicate that the entry-level of the students was equivalent.

Hypothesis 2: There is no significant difference in the post-test Mean academic achievement score of motor vehicle mechanics works student in teacher- to- students, student-to-students interactive teaching strategy, and Demonstration teaching method.

The data that provided the answer to this research question were analyzed and presented in Table 6

Table 6: Analysis of Covariance (ANCOVA) of Mean Achievement Score of MVMW Students at Post-test Treatment

Tests of Between-Subjects Effects					
Dependent Variable: Posttest Scores					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2190.703a	3	730.234	5.531	.002
Intercept	10875.996	1	10875.996	82.379	.000
Pre-test	2124.621	1	2124.621	16.093	.000
Teaching Methods	137.540	2	68.770	.521	.596
Error	11486.044	87	132.023		
Total	505208.000	91			
Corrected Total	13676.747	90			
a. R Squared = .160 (Adjusted R Squared = .131)					

The table 6 presents the data that was used to test the hypothesis and were analyses using Analysis of Covariance. The ANCOVA value for F was 0.521 and p- value of 0.596 therefore the

null hypothesis is accepted. These show that there is no significant difference in the Mean achievement score of MVMW students. These indicate that the teacher-to-students, Student-to-Students, and demonstration teaching strategy of learning have more effect on students' academic achievement of MVMW students in Adamawa State Technical Colleges

Findings of the Study

The finding emerged from this study was based on the analysis of data in line with the research question, the results of the finding indicated that:-

1. The entry-level of teacher-to-students, student-to-students interactive teaching strategies and demonstration teaching method indicate that the three groups were almost equivalent in their academic achievement and level of interest in MVMW.

2. Student-to-students interactive teaching strategy had achievement more than teacher-to-student interactive teaching strategy

3. Teacher-to-students interactive teaching strategy had achieved more than the Demonstration method

4. The student-to-student interactive teaching strategy achieved more than the Demonstration method

5. There is no significant difference in the Mean achievement score of MVMW students, These indicate that the entry-level of the students was equivalent

6. There is no significant difference in the Mean achievement score of MVMW students. These indicate that the teacher-to-students and Student-to-Students interactive teaching strategies has effect on students' academic achievement of MVMW students in Adamawa State Technical Colleges.

Conclusion

Among the two-teaching strategies investigated in this study for enhancing the academic achievement in Motor Vehicle Mechanic Work trade, all the teaching strategy yielded better result. This is so because the teacher-to-students, student-to-students interactive teaching strategies scored high after treatment. It then shows that the use of teacher-to-students, student-to-students interactive teaching and learning strategies and demonstration teaching method enhances better academic achievement in MVMW trade as an approach to teaching, it required that teacher work hard and consistently encourage students to work together and share knowledge among themselves.

It could be concluded that teacher-to-students and student-to-students interactive teaching strategies can be used in teaching in Technical Colleges of Adamawa State.

Recommendations

Based on the findings of the study, this recommendation was made:

The National Board for Technical Education (NBTE) should incorporate into the school curriculum of technical college, Teacher-to-Students and Student-to-Students interactive teaching strategies for teaching. Motor vehicle mechanic work.

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