

Effects of Collaborative and Cooperative Instructional Methods on Technical College Motor Vehicle Mechanics Students' Academic Achievement in Niger State, Nigeria

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Abstract

This study determined the effect of collaborative and cooperative instructional methods on technical college Motor Vehicle Mechanics (MVM) students' academic achievement. The study used the quasi-experimental research design; specifically the pre-test post-test non-equivalent control group experimental design. Multi stage sampling technique was used to arrive at the sample size of 264. Motor Vehicle Mechanics Achievement Test which was the instrument used, was validated and the tested reliability was 0.83. Data collected were analyzed using mean and ANCOVA at .05 level of significance. The findings revealed that: students taught with cooperative instructional method performed better as they have higher achievement scores in MVM than students taught with collaborative method; gender had an effect in favour of males in the achievement test as male students had higher mean gain in the mean achievement scores in MVM. There was no significant interaction effect of treatments given to students and their gender with respect to their mean achievement scores in MVM. The findings imply that cooperative instructional method is a viable teaching method for improving students' achievement in MVM. It is recommended that MVM teachers be encouraged, trained and equipped with necessary skills required to effectively use cooperative instructional method in teaching.

Keywords: *Technical College, Achievement, Motor vehicle mechanics, Collaborative and cooperative instructional method.*

Introduction

Collaborative Instructional Method (COLIM) and Cooperative Instructional Method (COPIM) are two group-oriented teaching methods used to teach students team work skills. COLIM is a group oriented teaching method that involves four to six students learning in groups and in which the teacher exercise less control over the learning activity by sitting down to watch to ensure orderliness as the interactive group learning activity progresses from one stage to the other based on the stated instructional objectives (Felder and Brent, 2001). Proponents of group oriented instructional methods claim that, the fact that students are actively exchanging ideas, debating and negotiating ideas within small groups not only increases achievement and interest among the participants but also promotes critical thinking and social skills (Slavin, 1995). It does not only teach social skills but facilitates retention, improves the experience, enhances creativity and also teaches leadership skills which is possible as team leader role is rotated among students

within each group in every new lesson class. Thus, the success of one student helps other students to succeed.

Johnson and Johnson (1995) revealed persuasive evidence that collaborative teams achieve higher levels of thought and retain information longer than students who work quietly as individuals. On the other hand, Cooperative instructional method (COPIIM) is a group oriented teaching method that involves students learning in groups and in which the teacher exercise more control over the learning activity by moving about in the classroom from one group to the other to ensure orderliness and active participation of learners as the interactive group learning activity progresses from one stage to the other based on the stated instructional objectives (Rosser, 2008).

Even though both COLIM and COPIIM are two group-oriented instructional methods, the two are operationally different. In COLIM the students are in control of their own learning and the teacher exercises less control over learning activity. Melinda (2008) revealed that in COLIM, the teacher exercises less control over group interactive learning activity because in COLIM the students are in control of their own learning and the group leader performs much of the teachers' facilitative role while in COPIIM, the teacher exercises full control over group interactive learning activity by fully monitoring and directing the group learning activity. In COPIIM the teacher observes, listens and intervenes in a group when necessary while in COLIM the activity is less monitored by the instructor as he redirects questions back to the group members. When questions are directed towards the teacher, the teacher guides the students to the information needed. COPIIM shifts the role of learning to the teacher while COLIM shifts the role of learning to the students. In COPIIM, the teacher still controls most of what goes on in the classroom, even though the students are working in groups while in COLIM, the students take full responsibility for learning together.

COLIM and COPIIM might bring improvement in the teaching and learning of Motor Vehicle Mechanics (MVM) in technical colleges. Moreso that effective maintenance of today's automobiles demand team work skills from technical college MVM students. MVM according to National Policy on Education (FRN, 2013) is one of the vocational programmes offered at the technical college level. Graduates of MVM according to National Board for Technical Education (NBTE, 2001), should among others be able to identify problems, repair and service mechanical, electrical and electronic system and components of cars, buses and trucks as well as display high cognitive achievement in MVM.

Students' academic achievement refers to students' performance score in response to a feedback from test and measurement (Anene, 2005). It is a measure of the extent to which instructional objectives are achieved. Unfortunately, the trend analysis of National Business and Technical Examinations Board (NABTEB) results in the past five years (2010 to 2014) as revealed by the NABTEB registrar, Olatunde (2014) showed that the students performance in terms of achievement in MVM in Niger State are consistently poor and less than 40%. The chief examiners report revealed the trends in performance fluctuations between 12.2%, 28.5%, 38.0%, 29.9% and 33.1% respectively. The repeated failure report and the prevailing deficiency in technical knowledge and requisite team work skills among automobile craftsmen show that the goals of MVM have not been fully achieved in technical colleges. This call for the need to try out new instructional methods such as collaborative and cooperative instructional method which the researcher believes may help inculcate in the trainees team work skills as well as improve students' achievement irrespective of gender. Gender refers to the status of being male or female. It has been documented that disparity exists between male and female students performance in science and technical subjects. The diverse opinions of scholars show that there is no conclusive argument on the influence of gender on students' achievement in MVM.

Apart from the NABTEB failure reports in MVM, Ogwo and Odigiri (2013), and Rosser (2008) in separate studies on instructional methods revealed that group oriented instructional method of teaching automobile trade subjects or courses has currently gained more relevance in meeting industrial needs because it encourages collaborative effort or team work which is currently a fundamental requirement for effective performance in the automobile maintenance trade in line with global best practice. It appears as if group oriented instructional method of teaching MVM is needed if the teacher is to expose the students to the transition towards team work skills and ability required in the modern automobile workplace. Due to the positive benefits of both COLIM and COPIM in enhancing instructional delivery, the researcher is not sure as to which is most suitable for exposing and preparing MVM students for the team work ability needed in the modern automobile workplace. This calls for an urgent need to study the effect of collaborative and cooperative instructional methods on technical college MVM students' academic achievement with a view to recommend adoption of the best to enhance effective teaching of MVM to improve students' achievement.

Purpose of the study

The purpose of this study was to determine the effect of collaborative and cooperative instructional methods on Technical college Motor Vehicle Mechanics students' academic achievement in Niger State, Nigeria. Specifically, the objectives of the study determined the:

1. Effect of collaborative and cooperative instructional methods on students' academic achievement in Motor Vehicle Mechanics.
2. Influence of gender on students' academic achievement in Motor Vehicle Mechanics when taught with collaborative and cooperative instructional methods.

1.5 Research Questions

The following research questions were raised to guide the study:

1. What is the effect of collaborative and cooperative instructional methods on students' academic achievement in Motor Vehicle Mechanics?
2. What is the influence of gender on students' academic achievement in Motor Vehicle Mechanics when taught with collaborative and cooperative instructional methods?

1.6 Research Hypotheses

The following null hypotheses tested at .05 level of significance guided the study.

H₀₁: There is no significant difference in the mean achievement scores of students taught MVM with collaborative instructional method and those taught with cooperative instructional method.

H₀₂: There is no significant difference in the mean achievement scores of male and female students taught MVM with collaborative instructional method and those taught with cooperative instructional method.

H₀₃: There is no significant interaction effect of treatments given to students and their gender with respect to their mean achievement scores in MVM.

Methodology

The study used the quasi-experimental research design; specifically the pre-test post-test non-equivalent control group experimental design. This study was conducted in Niger state and covered all the NBTE accredited Niger state owned technical colleges offering MVM. The target population for this study consisted of 387 Technical College two (TC II) MVM students in all

the Niger state owned technical colleges. This comprised of 367 males and 20 females. Multi stage sampling technique involving three stages was used to arrive at the sample size of 264. This comprised of 247 males and 17 females. The experimental group A had a population of 169 students while experimental group B had a population of 95 students. Two sets of lesson plans were designed and used to teach both experimental groups. The collaborative instructional lesson plan was used to teach experimental group A while the second set of the lesson plan was the cooperative instructional lesson plan which was used to teach experimental group B.

Motor Vehicle Mechanics Achievement Test (MVMAT) was the instruments used for data collection. The instrument as well as the lesson plan was validated by experts in the Department of Industrial and Technology Education of the Federal University of Technology, Minna, Nigeria. A pilot study was conducted and the reliability testing of the instrument (MVMAT) being a multiple choice type test was carried out with the use of Kuder-Richardson formula 20 (K-R 20) and a reliability coefficient of 0.83 was obtained. Through the Statistical Package for Social Sciences (SPSS) data collected were analyzed using mean and Analysis of Covariance (ANCOVA). Mean was used to answer the research questions while ANCOVA was used to test the hypotheses at .05 level of significance.

Results

Research Question One

Table 1

Pre-test and Post-test Mean Scores of Treatment Groups taught MVM with Collaborative and Cooperative Instructional Methods in the Achievement Test.

Group	N	Pre-test \bar{x}	Post-test \bar{x}	Mean Gain \bar{x}
COLIM	169	6.30	18.85	12.55
COPIIM	95	5.70	22.68	16.98

Key: N=Number of students, \bar{x} =Mean.

The result in table 1 revealed that, the students in the treatment group taught with COPIIM performed better in the achievement test than the students in the treatment group taught with COLIM. The positive achievement mean gain of COLIM (12.55) and COPIIM (16.98) shows that both COLIM and COPIIM are effective for improving students' achievement in MVM but COPIIM is more effective than collaborative instructional method.

Research Question Two

Table 2

Pre-test and Post-test Mean Scores of Male and Female Students Taught MVM with Collaborative and Cooperative Instructional Methods in the Achievement Test.

Gender	Collaborative Instructional Method				Cooperative Instructional Method			
	N	Pre-test	Post-test	Mean Gain	N	Pre-test	Post-test	Mean Gain
		\bar{x}	\bar{x}	\bar{x}		\bar{x}	\bar{x}	\bar{x}
Male	158	6.26	18.97	12.71	89	5.66	22.99	17.33
Female	11	6.91	17.18	10.27	6	6.17	18.12	11.95

The result in table 2 showed that male and female students taught MVM using COPIIM had a higher mean gain score than those taught using COLIM in the achievement test. This result also showed that the male students performed better than females. This may be an indicator of the existence of a gender attribute that has an effect on the achievement of students in Motor Vehicle Mechanics.

Hypotheses

Table 3

Summary of Analysis of Covariance (ANCOVA) for test of Significance of Three Effects: Treatments, Gender and Interaction Effects of Treatments and Gender on Students' Achievement in MVM

Source	Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	1082.079 ^a	4	270.520	18.185	.000
Intercept	5261.536	1	5261.536	353.698	.000
Pre-test	25.474	1	25.474	1.712	.192
Gender	167.526	1	167.526	11.262	.001
Treatment	98.933	1	98.933	6.651	.010
Gender*Treatment	32.932	1	32.932	2.214	.138
Error	3852.826	259	14.876		
Total	112989.000	264			
Corrected Total	4934.905	263			

***Significant at sig of F<.05**

Key: df=degree of freedom, F= ANCOVA F-ratio calculated by the computer, Sig.=Probability value calculated by the computer, Sig of F= Significance of F calculated by the computer, F<.05=Alpha level for taking decision on hypothesis when compare with Sig of F.

From the result in table 3, there is a significant difference between the mean achievement scores of students taught MVM with COLIM and those taught with COPIIM. The null hypothesis for treatment is therefore rejected, while the alternative form is accepted. On the hypothesis on

gender effect, the result presented showed that, there is a significant difference in the mean achievement scores of male and female students taught MVM with COLIM and those taught with COPIM. Therefore, the null hypothesis on gender effect was rejected, while the alternative form is accepted. Also the result on table 3 revealed that there is no significant interaction effect of treatments given to students and their gender with respect to their mean achievement scores in MVM. Therefore the null hypothesis for interaction effect of treatment and gender is accepted.

Findings of the Study

Based on the data collected and analyzed, the following findings were made:

1. Collaborative and cooperative instructional methods are both effective for improving students' achievement in Motor Vehicle Mechanics but, cooperative instructional method was more effective than collaborative instructional method.
2. There was an effect of gender in favour of males in the achievement test as male students taught Motor Vehicle Mechanics using both instructional methods had higher mean achievement scores than their female counterparts.
3. There was a significant difference between the mean achievement scores of students taught MVM with collaborative instructional method and those taught with cooperative instructional method, in favour of cooperative instructional method which had higher mean achievement scores.
4. There was a significant effect of gender in favour of males in the mean achievement scores of male and female students taught MVM with collaborative instructional method and when exposed to cooperative instructional method.
5. There was no significant interaction effect of treatments given to students and their gender with respect to their mean achievement scores in MVM.

Discussion of Findings

The data presented in table 1 provided answers to research question one. The finding is in agreement with the opinion of Goyak (2009) who carried out a study on the Effects of Cooperative Learning Techniques on Perceived Classroom Environment and Critical Thinking Skills of Preservice Vocational Teachers and found out that cooperative instructional method is more effective in enhancing students' achievement in vocational trades. This finding is possibly due to the fact that in cooperative instructional method, teacher exercises more control over the group learning activity. This was buttressed by Rosser (2008) who studied cooperative learning

and discovered that the greater control exercised by the teacher in directing cooperative learning help to ensure orderliness in the classroom as well as enhance active participation of students in the group interaction activities. The effectiveness of cooperative instructional method can also be confirmed in a similar study by Jumoke and Idowu (2012) on the effectiveness cooperative learning strategies on students achievement in Basic Science, where they found out that cooperatively taught students display lower levels of anxiety and stress, greater intrinsic motivation to learn and achieve, greater ability to view situations from others' perspectives, more positive and supportive relationships with peers and more positive attitudes toward Basic Science.

The data shown in table 2 provided answers to research question two while table 3 provide answers to the hypotheses tested. This finding is in agreement with the findings of several other studies that have been conducted on interaction effect of gender on achievement. For instance, Ogundola, Abiodun and Jonathan (2010) in a study on the effects of constructivist instructional approach on teaching practical skills to mechanical trade students in western Nigeria technical colleges, affirmed that there was no significant interaction effect between male and female students' achievement. This view was reiterated by Popoola (2002) who in a study on gender difference in Nigeria, found no significant interaction effect in academic achievement in science subjects between male and female students. Also Onibokun (1990) in a study on achievement motivation disparity between boys and girls in Nigeria, also supported this when they revealed that gender have no significant interaction effect in the academic achievement between male and female students.

The implication of this finding is that if both male and female students are properly taught and are also serious with their study, they both have the potentials of having high achievement scores. This is supported by the constructivist theory of Jean Piaget and Bruner which according to Driscoll (2000) is devoid of gender bias but is based on the assumption that knowledge is constructed by learners (irrespective of gender) as they attempt to make sense of their learning experiences through cooperative interaction. In another view, Owodunni (2009) in a study on gender inequality in technical and vocational education found out that gender role affect familiarity with academic content, career aspirations, attitude toward subjects, teacher expectations and preferred approaches which also affect academic achievement and interest of

students. This could be an indicator of the existence of a gender attribute that has an effect on the achievement of students in Motor Vehicle Mechanics.

Conclusion

Assisting the learner to learn to acquire the desired work skills is the ultimate goal of any instructional method. If an instructional method does not facilitate acquisition of the desired knowledge, skill attitude or behaviour then it is ineffective, has no value and the expected learning outcome will not occur. If the MVM teacher is to expose the students to the transition towards team work ability required in the modern automobile workplace, then there is need to adopt cooperative instructional method which the researcher believe is more effective in teaching MVM in technical colleges.

Recommendations

Based on the findings from this study, the following recommendations were made:

1. Motor Vehicle Mechanics teachers should adopt cooperative instructional method to improve teaching and learning of team work skills.
2. The National Board for Technical Education, National Business and Technical Examinations Board, Niger state technical education board should periodically organize retraining programmes inform of workshops, seminars and conferences to update the technical teachers on the skills and procedures for teaching using cooperative instructional method.
3. At regular intervals the teachers at technical colleges should be given orientation to create awareness on the relevance and need to prepare the automobile craftsman for the world of work by adopting cooperative instructional method that teaches team work ability.
4. Cooperative instructional method should be adopted at technical teacher training programmes in tertiary institutions to prepare the teacher for cooperative teaching task needed for effective teaching and learning in schools.
5. The curriculum planners and developers should carry out curriculum improvement to capture cooperative learning activities and experiences.

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