

EFFECT OF JIGSAW COOPERATIVE AND MASTERY LEARNING METHODS ON STUDENTS LEARNING OUTCOMES IN FURNITURE MAKING IN TECHNICAL COLLEGES, NIGER STATE

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Abstract

The study investigates the effect of jigsaw cooperative and mastery learning methods on students learning outcomes in furniture making in Technical Colleges, Niger State. The study adopted the quasi-experimental research design, precisely, pre-test, post-test non-equivalent control group design. The population for the study was 210 National Technical Certificate (NTC II) furniture makings students in Technical Colleges in Niger State. This study was conducted in Niger State. Two research questions and Two null hypotheses tested at 0.05 level of significance guided the study. The instrument used for data collection were Furniture Making Cognitive Achievement Test (FMCAT) and Furniture Making Interest Inventory (FMTII). The FMCAT was drawn based on a table of specification. The Jigsaw cooperative and Mastery learning methods lesson plan, FMCAT, and FMTII were subjected to face and content validation by three experts. The instrument was trial tested on a sample of 22 NTC II furniture makings students of Government Technical College Garki, Abuja. Cronbach alpha Coefficient were utilized to establish the coefficient of internal consistency and stability of the FMCAT. The values were found to be 0.72 and 0.81 respectively. Data obtained from the administered of the instrument was analysed using mean to answer the three research questions and Analysis of Covariance (ANCOVA) statistic was used to test the three hypotheses. The study revealed that jigsaw cooperative method is more effective in improving student's achievement in furniture makings than mastery learning methods. It was also discovered that Jigsaw cooperative and mastery learning methods are effective in stimulating students' interest in furniture makings. There was no significant effect on students' achievement and interest in furniture makings. It was recommended that State Ministry of Education, National Business and Technical Examination Board (NABTEB) and National Board for Technical Education (NBTE) should organize workshops, seminars and in service training for woodwork teachers on regular basis to enlighten and improve their knowledge and skills on the use of the Jigsaw cooperative and the mastery learning methods.

Keywords: Jigsaw cooperative method, Mastery learning, achievement, interest, retention, Furniture Making

Introduction

Technical education, of which furniture making is a part, is that aspect of education, which involves the acquisition of techniques and application of the knowledge of the science for the improvement of man's surrounding. It deals with the training of manpower from professional category such as engineers and technologists through the technician down to the skilled category, which includes craftsmen and artisans (Miller, 2014). The contribution of furniture

making to the development of a nation cannot be disputed as this profession is embraced and recognized worldwide.

Furniture making in the Technical Colleges is a trade programme that is aimed at studying the Technical competencies in trade-related areas which include furniture making, carpentry and joinery and machine woodworking shop practice. Furniture making according to Violation (2010) refers to activities of using wood for the purpose of construction and other associated project and design activities. The Technical College furniture making curriculum is designed to meet requirements necessary to prepare students for employment, self-reliance and/or entrepreneurial ventures. Training then needs to be conducted for furniture making students in technical colleges so as to achieve these lofty objectives. Failure in furniture making subject predates Nigerians independence (Taiwo, 2011). This situation, has not improved but rather has continued to deteriorate (Okebukola, 2010). Hence, it is a source of concern for researchers. Some researchers have identified defective teaching methods as one of the reasons for the poor performance of students in furniture making in NABTEB examinations. For example, it has been discovered that the persistent poor academic achievement and low interest of students in furniture making is as a result of the inappropriate teaching methods adopted by teachers (Ajerole & Adenoyin, 2006). Teaching furniture making at the Technical Colleges requires good teaching skills and mastery of the subject matter. For the Technical College graduates to be well trained in furniture making, their teachers must have possessed the needed competencies for teaching the subject at the Technical colleges. Okebukola maintained that instructional techniques are subsumed in teaching methods as ancillaries to ensure the effectiveness of the teaching methods to arouse students' interest in order to improve education.

Improvement in the academic achievement, interest and retention of students of furniture making in Technical Colleges needs to be taken seriously so that there would be better achievement in the NABTEB examinations. Epunam (2009) defined achievement as the learning outcomes which include knowledge, skills that are acquired and retained through course of study within and outside the classroom situation that can help to have a better achievement in public examination. Academic achievement has been described as a view on how well an individual has done his cognitive tasks. It may also be regarded as the general ability of students concerning their offered subjects compared to a specified standard called Pass Marks' (Abubakar, 2013).

Interest is an important factor in learning, it is viewed as the feeling that an individual has when he or she wants to know or learn more about something such as Woodwork technology. There is no doubt that students' academic achievement and interest should be improved so as to generate desirable changes in the achievement of students of furniture making in Technical colleges. To improve academic achievement and interest of furniture making students, there is need to adopt jigsaw cooperative and mastery learning method of teaching.

Jigsaw cooperative is a teaching method in which learners are responsible for learning, the material and teaching it to other learners. Jigsaw activity has been a teaching activity that can be used by teachers of all grades in their classrooms. Many educators have adapted and employed the Jigsaw technique in their classes (Zhan & Georgia, 2011). Jigsaw technique encourages student participation in a classroom where learners have a critical role for success and this success depends on active cooperation and participation of students. Using Jigsaw

technique increases the variety of learning experiences, and teaches learners course content and cooperative social skills (Perkins *et al.*, 2011).

Mastery learning has been one of the more recently developed instructional models and interventions used by teachers to foster academic enhancement among students. Mastery Learning is one teaching model under the behavioral systems family of models (Filgona *et al.*, 2017). It is an instructional strategy proposed by Benjamin in 1968 which upholds that students must attain a level of mastery in requirement knowledge before stirring to learn the succeeding information. If students do not succeed mastery in the test, they would be given extra support by reviewing the lesson and undergo retest.

This study will therefore, ascertain if students' achievement and interest in studying furniture making after being exposed to jigsaw cooperative and mastery learning methods.

Statement of the Research Problem

The poor performance of candidates in Furniture making as reflected by the NABTEB Examinations results has continued to trigger a lot of concern among educationists and other stakeholders nationally over the years. This poor performance in Furniture making among other factors is likely to undermine by the teaching method used. According to Aronson (2014), students' performance excels when cooperative learning strategies, including jigsaw are implemented. The traditional place of learning in our educational system is in great danger. A critical look at student's overall performance in Furniture making at NABTEB results between 2017 and 2019 reveals that it has persistently continued to decline, with average scores of 26.99% in 2017 and 19.13% in 2019. The Teaching method is a crucial factor that may affect students' motivation and consequently achievement. However, what is not known is how jigsaw cooperative and mastery learning methods affects motivation to learn Furniture making by Learner. The decision to research on cooperative and mastery learning strategies in technical colleges in Niger State is based on reality that most of schools embrace traditional learning strategy.

It has also been observed that the teacher-centered method is the main teaching method employed by the technical teachers for implementing the curriculum (Filgona *et al.*, 2017). Obviously, the adoption of teacher centered methods of teaching by the teachers results into ineffective use of varieties of instructional method and instructional techniques and inability of teachers to effectively implement the curriculum to naturally increase students' interest, involvement and commitment in learning (Ive, 2017). The short coming in teacher-centered method of teaching could be responsible for poor academic achievement of furniture making students in public examination (Aronson, 2014). In an attempt to address this issue, the present study explored effects of jigsaw cooperative and mastery learning methods on motivation to learn Furniture making by gender in Technical Colleges in Niger State.

Objectives of the Study

1. The effect of Jigsaw cooperative and Mastery learning methods on students' academic achievement in furniture making.
2. The effect of Jigsaw cooperative and Mastery learning methods on students' interest in furniture making.

Research Questions

The following research questions were answered to guide the study.

1. What are the effects of Jigsaw cooperative and Mastery learning methods on student achievement in furniture making?
2. What are the effects of Jigsaw cooperative and Mastery learning methods on students' interest in studying furniture making?

Hypotheses

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

- Ho₁: There is no significant difference in the mean achievement score of students taught furniture making with Jigsaw model and those taught with Mastery learning method.
- Ho₂: There is no significant difference between the interest scores of students taught furniture making with Jigsaw model and those taught with Mastery learning method.

Methodology

A Quasi – experimental research design was used for this study. The Study was conducted in the six state-owned technical colleges of Niger State, Namely Government Technical College Eyagi Bida, Government Technical College Kontagora, Government Technical College Minna, Government Technical College New Bussa, Mamman Kontagora Technical College Pandogari and Suleiman Barau Technical College Suleja. The population for this study consists of 210 NTC II students of furniture making in the six Technical Colleges in Niger State. A simple random technique was used to select two Technical Colleges from the six Technical Colleges involved in this study as a sample. Government Technical College Eyagi Bida and Government technical college Minna the schools selected.

The instrument used for data collection in this study were Furniture making Cognitive Achievement Test (FMCAT) and Furniture making Interest Inventory Scale (FCIIS). The Furniture making Cognitive Achievement Test (FMCAT) instrument was validated by one subject expert in furniture making with National Business and Technical Examination Board (NABTEB) and two woodwork technology education experts from Department of Industrial and Technology Education, Federal University of Technology, Minna. A trial test of the instrument was carried out for the purpose of determining the coefficient of stability of the Furniture making Cognitive Achievement Test (FMCAT) using test retest reliability technique. The reliability coefficient of the FMCAT and FCIIS were redetermined using Cronbach alpha coefficient. The overall reliability coefficient of 0.81 was obtained which indicated that the instrument is reliable.

The furniture making teachers administered the pre-test to both the Jigsaw cooperative learning method and the Mastery learning method students in their respective colleges. The data collected from the administration of pre-test, post-test and retention of learning were analyzed using mean to answer the research questions. Standard deviations show the closeness of the results to the mean. The pre-test, post-test mean gain of each of the groups were compared to determine the group that performed better. The null hypotheses were tested using Analysis of Covariance (ANCOVA) at 0.05 level of significance.

Results

Research Question One

What is the effect of Jigsaw cooperative and Mastery learning instructional methods on students' achievement in furniture making?

Data collected for research question one is presented in Table 1.

Table1: Mean and Standard Deviation Scores of Students taught Furniture Making Based on Method in the Achievement Test

METHOD	N	Pretest		Posttest		Mean Gain/loss
		Mean	SD	Mean	SD	
Jigsaw Method	39	34.85	8.74	64.92	22.57	30.07
Mastery learning methods	29	27.62	11.31	36.76	6.85	3.14

Table 1 shows that pretest achievement mean and standard deviation scores for students taught furniture making using Jigsaw cooperative are 34.85 and 8.74, while those taught furniture making using Mastery learning methods are 27.62 and 11.31. This shows that both groups were not in the same achievement standing prior to experimental treatment. However, posttest achievement mean and standard deviation score for Jigsaw cooperative are 64.92 and 22.57, while the posttest mean and standard deviation scores for Mastery learning methods are 36.76 and 6.85. The analysis of this result shows that the jigsaw cooperative learning method achievement test score is higher than the achievement score of mastery learning method. Therefore jigsaw cooperative learning method is more effective than the mastery learning method in enhancing students achievement in furniture making.

Research Question Two

What is the effect of Jigsaw cooperative and Mastery learning methods on students' interest in studying furniture making?

Data collected for research question one is presented in Table 2.

Table 2: Mean and Standard Deviations Interest Scores of Students Taught Furniture making based on Method in the interest scale or inventory

METHOD	N	Pre-interest		Post-interest		Mean Gain/loss
		Mean	SD	Mean	SD	
Jigsaw method	39	2.84	0.32	3.01	0.42	0.17
Mastery learning method	29	2.93	0.29	3.03	0.37	0.10

Table 2 shows that pre-interest mean and standard deviation scores for students taught furniture making using Jigsaw model are 2.84 and 0.32, while those taught furniture making using Mastery learning method are 2.93 and 0.29. This shows that both groups were almost the same in their interest score prior to experimental treatment. However, posttest interest mean and standard deviation scores for Jigsaw cooperative are 3.01 and 0.42, whereas the posttest mean and standard deviation scores for Mastery learning methods are 3.03 and 0.37. The analysis of this result shows that the jigsaw cooperative learning method interest score is higher

than the interest score of mastery learning method. Therefore jigsaw cooperative method is more effective than the mastery learning method in enhancing students interest in furniture making.

Hypo-thesis Testing Hypo-thesis One

There is no significant difference between the mean achievement scores of students taught furniture making with Jigsaw model and those taught with Mastery learning method.

To test this formulated hypothesis, Analysis of Covariance (ANCOVA) was employed, and the result presented in Table 3.

Table3: Analysis of Covariance (ANCOVA) of Students Mean Achievement Scores in Furniture making Based on Method Tests of Between-Subjects Effects

Dependent Variable: posttest					
Source	Type III sum of squares	df	Mean square	F	Sig.
Corrected model	23209.818 ^a	2	11604.909	36.605	.000
Intercept	13582.970	1	13582.970	42.844	.000
Pretest	66.430	1	66.430	.210	.649
Method	22686.902	1	22686.902	71.560	.000
Error	20607.167	65	317.033		
Total	207183.000	68			
Corrected Total	43816.985	67			

a.R Squared=.530 (Adjusted R Squared=.515)

Table 3 indicates that F-ratio (71.56) with associate probability (sig(2-tailed))(p=0.000) under method is less than significant level(0.05) the postulated hypothesis. Hence, the researcher failed to uphold the null hypothesis, which means that the alternative hypothesis was upheld. Therefore, there is a significant difference between the mean achievement scores of students taught furniture making with Jigsaw model and those taught with Mastery learning methods.

Hypo-thesis Two

There is no significant difference between the mean interest scores of students taught furniture making with Jigsaw cooperative and those taught with Mastery learning method. To test this formulated hypothesis, Analysis of Covariance (ANCOVA) was employed, and the result presented in Table 4.

Table 4: Analysis of Covariance (ANCOVA) of Students Mean Interest in furniture making Based on Method Tests of Between-Subjects Effects

Dependent Variable: post interest					
Source	Type III sum of squares	df	Mean square	F	Sig.
Corrected model	.346 ^a	2	.173	1.070	.349
Intercept	8.738	1	8.738	54.056	.000
Pretest	.226	1	.226	1.396	.242
Method	.036	1	.036	.223	.638
Error	10.507	65	.162		
Total	612.547	68			
Corrected Total	10.853	67			

R Squared=.032 (Adjusted R Squared=.002)

Table 4 indicates that F-ratio (0.223) with associate probability (sig (2-tailed) ($p=0.638$) under method is greater than significant level (0.05) postulated. Hence, the alternative hypothesis was upheld. Therefore, there is no significant difference between the mean interest scores of students taught furniture making with Jigsaw model and those taught with Mastery learning methods.

Discussion of Findings

Findings revealed that Jigsaw cooperative is more effective in improving students' cognitive achievement in furniture making than Mastery learning methods. The implication of this finding is that Jigsaw model is more effective than Mastery learning methods in enhancing students' achievement in furniture making. The findings is in line with Akor (2000) and Pekene (2002) who in their study revealed that students taught with Jigsaw model performed significantly better than those taught with Mastery learning methods in physics. The findings further revealed that Jigsaw model has positive effect on students' achievement which is similar to the findings of Nekang (2011) who in his study found out that the adoption of Jigsaw model in the teaching of trigonometry students improved the students achievement in trigonometry than the students taught with Mastery learning methods. A possible explanation for the effectiveness of Jigsaw model is the students' active involvement in learning process using cooperative and intensive way, clarifying, probing and questioning as the students manipulate the materials and tools given to them. The Analysis of covariance indicates that there is a significant difference between the mean achievement scores of students taught furniture making with Jigsaw model and those taught with Mastery learning methods in favour of Jigsaw group with high mean gain score of 30.07. This confirms, to some extent the findings of Al-Salkhi (2015) which conducted a study on Jigsaw Based Cooperative Learning approach to improve learning outcomes for mobile situated learning using experimental design Pre-test - Post-test. The results showed that the Jigsaw method of Cooperative Learning improved the students' learning attitudes and improved the efficiency of learning.

A similar study was undertaken by Temesgen and Enunuwe (2016). The research was also based on Jigsaw Cooperative Learning teaching style on students' achievement in organic chemistry. The study used 51 students in the intervention group and 54 students in the Control Group. The results indicated that there was statically significantly difference between intervention and control groups with the two sample t-test at $P < 0.05$ taken on the quiz and post-test achievement scores of students. The intervention group students performed better than those in the Control Groups. The results also showed that the responses to the questionnaires gathered from the intervention group in terms of Cooperative Learning was effective as they exhibited a deep understanding of chemistry concepts as they worked together in their groups. In a related study, Mengduo and Xiaoling (2010) examined Jigsaw Cooperative Learning in English reading. The study comprised 146 freshmen students' majority in Arts in two different classes of Grade One. The results revealed that Cooperative Learning was more effective than Traditional Approaches in teaching reading.

The findings showed that the group taught furniture making with Jigsaw model had a mean interest score of 2.84 in pre-test and a mean interest score of 3.01 in the post-test while the group taught furniture making with Mastery learning methods had a mean interest score of 2.93 in the pre-test and a post-test mean of 3.03. This shows that group taught using Jigsaw cooperative learning methods have a mean gain interest score of 0.17 while Mastery learning methods group have a mean gain interest score of 0.10. This implies that both models improve students' interest in furniture making agreeing with the study conducted by Obi (2006) and Alio (1997). The Analysis of Covariance showed that there is no significant difference between the mean interest scores of students taught furniture making with Jigsaw model and those taught with Mastery learning methods. Gambari, and Yusuf (2014) conducted a research on effectiveness of Computer-Supported Jigsaw 11 Cooperative Learning Strategy on the performance of senior secondary school student in Physics. The study reported that students taught physics using Computer-Supported Jigsaw 11 performed better than those who used Individualized Computer Instructions. Also, the results indicated that students who used Jigsaw 11 Cooperative Learning Strategy had positive attitudes to physics than those taught with Individualized Computer Instructions. However, students' gender had no influence on their performance. Van Dat (2016) studied the effects of Jigsaw Learning on students' knowledge retention in Vietnamese higher education. The result indicated that students in the Cooperative Jigsaw Group appreciated most working with others as they got help, discussed and shared information, taught others, and enjoyed the Jigsaw context. The findings of the study revealed that students in Jigsaw Group had greater long-term achievement than those who got theirs through lecture group.

Conclusion

This study was set out to determine the effect of Jigsaw cooperative and Mastery learning methods on technical college students' academic achievement, interest and retention in furniture making in Niger state. The study revealed that Jigsaw model is more effective in improving students' academic achievement and retention but that both Jigsaw and Mastery learning methods arouse and sustain students' interest in furniture making. These results therefore showed that Jigsaw cooperative and Mastery learning methods are viable alternative to the teacher centered method of teaching furniture making. Instructional methods such as Jigsaw cooperative and Mastery learning methods give technical teachers opportunity to engage students in real world of class room exercises.

It gives students the opportunity to develop valuable thinking skill and acquire an understanding about the technology world. Thus, if Jigsaw cooperative and Mastery learning methods are adopted to teach furniture making in technical colleges, students will, undoubtedly, be equipped with knowledge and skills in furniture making as well as perform and cope more effectively with requisite furniture making skills needed for work in the industry, for self-reliance and present world of work.

Recommendations

Based on the findings of this study, the following recommendations are made:

The study recommends that furniture making teachers should adopt the use of Jigsaw cooperative and Mastery learning methods for teaching and learning of furniture making in technical colleges to improve student's achievement and interest.

Seminars, workshops and in-service programs should be organized by NBTE to enlighten technical teachers and improve their knowledge and skills on the use of the Jigsaw cooperative and Mastery learning methods for improving students' performance in furniture making.

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