

Self-Regulatory Learning and Active Learning Approaches on Students of Technical College Psychomotor Achievement in Furniture Craft

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Abstract

This study was designed to determine the effects of self-regulatory learning and active learning approaches on technical college students' psychomotor achievement in furniture craft. A pre-test, post-test, non-equivalent control group, the quasi-experimental research design was adopted. The study constituted a total number of 122 subjects, 63 for Active learning, while 59 for self-regulatory learning. The instrument used for data collection was Furniture Craft Psychomotor Achievement Test (FCPAT). The instruments were also subjected to face validation by two experts in furniture craft from the Department of Industrial and Technology Education, Federal University of Technology Minna. The FCPAT was trial-tested to determine its psychometric indices and reliability coefficient. The trial test for determining the coefficient of stability of the FCPAT was carried out using the test re-test reliability method. The Pearson product-moment correlation coefficient of FCPAT was found to be .78. Mean was used to answer the research questions; while ANCOVA was employed to test the hypotheses. The study revealed that students who taught furniture craft using the active learning approach had a higher mean score than students taught using the self-regulatory learning approach in the psychomotor achievement test. In each mean score of males taught furniture craft using active learning approach was higher than the mean score of females taught using the same active learning approach in psychomotor achievement test. The differences in the mean scores of males and females in the psychomotor achievement test were found to be insignificant. Consequently, the research recommended that; The National Board for Technical Education (NBTE) should consider a review of the furniture craft curriculum for Technical Colleges to incorporate the active learning approach into the teaching of furniture craft among others.

Keywords: Self-regulatory learning, Active learning, Furniture craft, Technical colleges, Students.

Introduction

Technical colleges are regarded as the principal vocational institutions in Nigeria established to prepare individuals to acquire practical skills, knowledge, and attitudes for effective participation in the world of work. Hussaini (2015) stated that technical colleges give training intended to prepare students for entry into various occupations or trades. One of these trades is Furniture Craft. Furniture Craft is a woodworking trade that is concerned with office households and other artifacts of man. These include beds, chairs, Tables, wardrobes, doors, kitchen cabinets, windows, and several other

artifacts. The technical colleges train craftsmen in Furniture Craft so that they can be self-reliant in Furniture craft.

Furniture Craft is one of the vocational education trades in Nigerian technical colleges. It is designed to meet the need of craftsmen that will repair, construct and maintain all kinds of furniture items. Furniture Craft in technical colleges is geared towards the production of technicians and craftsmen who have skills, attitudes, and knowledge to meet the demand and the development in the Furniture Craft industries. These craftsmen and technicians are expected to design, construct and repair modern furniture. According to Pam (2012), furniture craft technology as part of vocational-technical education is a type of training intended to prepare the students to earn a living in an occupation in which success is dependent largely on an understanding of technology as applied to modern technology and design. This type of education provides skills, knowledge, and attitudes necessary for effective employment in a specific occupation (Okoro, 2009).

The rapid changes in technology have necessitated the need to equip technical college students with workplace basic and thinking skills which will make them flexible and adaptable to the present and envisaged future changes. Technology, the world over is dynamic and work organisations are getting increasingly flexible, process-based, and multi-tasking. This is to suit the demands of the prevalent knowledge society and ample use of innovations and inventions in workplaces and changes in the organisation of work (Ogwo & Oranu, 2008). In this context, there is a need for educational institutions to adjust their curriculum to accommodate changes in workplaces to produce students with workplace basic skills required to thrive in the 21st-century knowledge-based economy and society (Boyle, Duffy & Dunleavy, 2011). The changes in the curriculum of woodwork technology are also necessary to accommodate changes in the sector for better achievement.

The achievement of furniture craft students in the National Business and Technical Examinations Board (NABTEB) especially that of 2016/2017, 2017/2018, 2018/2019 has not been encouraging. This continuous poor academic achievement most often reduces students' interest and can lead to poor knowledge in furniture craft as well as other adverse effects on the entire programme objectives of the woodwork. Students sometimes hate a subject that records a high rate of failure in examination and knowledge is seriously dependent on achievement. Considering this poor achievement of students in furniture craft subject, one is bound to be worried. Teaching and learning in furniture craft, however, might be enhanced by the adoption of teaching/learning approaches such as self-regulatory learning and active learning approach.

Self-regulation is described as the individuals' ability to direct their actions towards goals and ideals which can come from personal desires or the expectations of others and helps individuals adjust to the demands of society and the environment. Zimmerman (2013) believes self-regulation is of great importance for the existence of mankind because it is directly linked to being socially accepted and depending on the group, as humans tend to get most of what we need from other humans.

Behrke (2012) divides self-regulatory processes into different stages, namely, self-control, goal-setting and goal attainment, self-evaluation, self-importance, self-efficiency, self-regulatory failure, and so on. Knowing and understanding these processes can improve self-regulation and motivation. Zimmerman (2013) explains why we can self-regulate some actions and not others. Unlike the metacognitive approach to self-regulation which emphasizes the level of knowledge and deductive thinking when selecting a cognitive strategy, Zimmerman applies a social cognitive perspective and advises including the individuals' self-beliefs and emotional responses, such as fear or doubt in the process.

Active-learning which engages students in the process of learning through activities and/or discussion in class, as opposed to passively listening to an expert. It emphasizes higher-order thinking and often involves group work" (Freeman *et al.*, 2014). Active learning provides opportunities for meaningful academic activities which has a positive impact on retention especially of first year students (Kuh *et al.*, 2008). The classroom is therefore rapidly transitioning from a teaching-centered to a learning-centered environment as a result of a recognition of the positive impact of active learning. However, the biggest challenge to incorporating active learning in the classroom is the duration of the class period. One of the approaches to freeing up class time for active learning is the "flipped classroom". In the flipped classroom approach, the "lecture" is moved out of the classroom in the form of engaging audio-video enhanced learning material for students to study before coming to class. The classroom time can now be effectively dedicated to carefully design hands-on activities that strengthen the concepts, provide opportunities to move towards skills automaticity, and enhance critical thinking skills for psychomotor achievement.

Psychomotor achievement simply relates to students' achievement in practical tasks. Therefore in this study, psychomotor achievement refers to the achievement of students in Furniture craft practical task which is usually represented by a score or mark obtained in a performance test. Okoro (2009) explained that a performance test involves the use of tools and equipment in a direct assessment of the number of practical skills possessed by the student. According to Ogbunanya and Fakorede (2008), a student's psychomotor achievement is influenced by several factors among which are the instructional method and the learner's ability. However, it is also observed that students' cognitive and psychomotor achievement may also be influenced by the gender of the student.

Gender refers to the characteristics, whether biological or socially influenced, by which people define male and female (Myers, 2007). Gender may also be explained as the socially constructed roles, behaviours, activities, and attributes that a given society considers appropriate for men and women. Disparities according to Okoro (2009) usually exist in the levels of performance between males and females. This study will, therefore, ascertain if students' achievement, retention of learning, and interest in studying Furniture craft will reflect students' gender after being exposed to a self-regulatory learning approach and active learning approach. The abilities of a furniture craftsman in the area of construction and repair of woodwork products may therefore

be enhanced through teaching and learning approaches such as self-regulatory learning strategy and active learning approach. Hence, this study will attempt to find out which of these teaching/learning approaches will be more effective in improving students' psychomotor achievement in furniture craft.

Statement of the problem

The skills needed in the design, processing, and production of furniture products are becoming increasingly complex. This is as a result of the rapid rate of technological development in the world of work. The furniture construction workplace has improved technologically especially in the 21st century where employers in the Woodwork world of work are seeking employees with workplace skills such as higher-order thinking skills, creativity, and problem-solving skills.

The conventional teaching methods (such as lecture and demonstration methods) adopted by most furniture craft teachers in technical colleges seem inadequate for equipping the furniture craftsmen with the workplace skills such as flexibility, adaptability, creativity, high order thinking and problem-solving. These teaching/learning methods are teacher-centered, hence, do not give students enough opportunities to think for themselves and actively participate in the learning process. The shortcoming of these methods of teaching could partly be responsible for the poor performance of furniture craft students in examinations over the years in Niger State. It has been observed that most of the furniture craftsmen from technical colleges even after employment often abandoned their occupation or have their attention divided over another vocation and even engage in jobs like hawking of petroleum products, illegal foreign exchange market business, and political thuggery which are not in line with the training they received. Hence, it was necessary to adopt approaches that would be more effective in improving students' psychomotor achievement in furniture craft. This study is, therefore, designed to determine the impact of self-regulatory learning and active learning approaches on technical college students' psychomotor achievement in furniture craft in Niger State.

Purpose of the study

1. Effect of self-regulatory learning and active learning approaches on students' psychomotor achievement in furniture craft.
2. Influence of gender (male and female) on students' psychomotor achievement in furniture craft.

Research Questions

1. What is the effect of self-regulatory learning and active learning approaches on students' psychomotor achievement in furniture craft?
 2. What is the influence of gender (male and female) on students' psychomotor achievement in furniture craft ?
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Hypotheses

The following null hypotheses guided the study and were tested at a 0.05 level of significance:

H_{01} : There is no significant difference between the mean effect of self-regulatory learning and active learning approaches on students' psychomotor achievement in furniture craft.

H_{02} : There is no significant difference between the mean effect of gender on furniture craft psychomotor achievement of students (male and female) using self-regulatory learning and active learning approaches.

H_{03} : There is no significant mean interaction effect of treatment given to students using self-regulatory learning and active learning approaches and their gender (male and female) to their mean scores in furniture craft psychomotor achievement test

Methodology

This study adopts a quasi-experimental design. Specifically, the pretest, post test design was employed for the study. The study was conducted in Niger state because the state is one of the states where students' poor performance in furniture craft was reported by the National Board for Technical Education (NBTE) 2016- 2019. The population for this study consists of all 122 second-year students of furniture craft in the four technical colleges offering furniture craft in Niger State. A simple random sampling technique (balloting) was used to assign two schools to the self-regulatory learning approach group and two schools to the Active learning approach group. Two intact classes of year II students each to the two treatment groups. The instrument used for data collection for this study was the furniture craft psychomotor achievement test (FCPAT). The FCPAT was developed by the researcher based on the NBTE NTC II furniture craft trade curriculum and course specifications. The instrument face was validated by two experts from the Department of Industrial and Technology Education, Federal University of Technology, Minna.

The FCPAT was trial-tested on 40 NTCII students in Government Technical College, Patigi, Kwara State using the test-retest reliability technique. GTC, Patigi was used because it did not form part of the study institutions but uses the same entry requirement as the study groups. The reliability of the FCPA was determined using the Pearson Product Moment Correlation Coefficient and was found to be .78. A pre-test was administered to the two groups using FCPAT. The data collected from the pre-test and post-test were analysed using the mean to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the null hypotheses at a 0.05 level of significance.

Research Question 1

What is the effect of self-regulatory learning and active learning approaches on students' psychomotor achievement in furniture craft?

Table 1 : Mean and standard deviation of pretest and posttest scores of AL approach group and SRL approach group in psychomotor achievement test for achievement test

Group	N	Pretest scores \bar{x}	SD	Posttest scores \bar{x}	Mean gain
AL	63	17.66	10.08	65.87	48.21
SRL	59	21.35	9.81	66.01	44.66

Table 1 shows that the AL approach group had a Mean score of 17.66 and a Standard Deviation of 10.08 in the pre-test and a Mean score of 65.87 and a Standard deviation of 13.51 in the post-test making a pre-test, post-test Mean gain of 48.21. SRL approach had a Mean score of 21.35 and Standard Deviation of 9.81 in the pre-test and a post-test Mean of 66.01 and Standard Deviation of 13.31 with a pre-test, post-test Mean gain of 44.66. With these results, both the AL approach and SRL approach are effective in improving students' psychomotor achievement in furniture craft but the effect of the AL approach in improving students' psychomotor achievement in furniture craft is higher than the effect of the SRL approach.

Research Question 2

What is the influence of gender (male and female) on students' psychomotor achievement in furniture craft?

Table 2 : Mean and Standard Deviation of Pretest and Posttest Gender Psychomotor achievement Scores of students taught using AL approach and SRL approach

Group	Gender	N	Pretest \bar{x}	SD	Posttest \bar{x}	SD	Mean gain
AL	M	50	16.33	9.29	64.80	13.60	48.47
	F	13	18.45	12.85	68.41	12.69	49.96
SRL	M	46	22.91	8.74	64.89	13.37	41.98
	F	13	20.16	12.93	70.41	12.69	50.25

The data in Table 2 shows that male students taught furniture craft with AL approach had a Mean score of 16.33 and Standard Deviation of 9.29 in the pre-test and a Mean score of 64.80 and Standard Deviation of 13.60 in the post-test making a pre-test, the post-test mean gain in the male students of 48.47. Female students taught furniture craft with AL approach had a mean score of 18.45 and a Standard deviation of 12.85 in the pre-test and a post-test Mean of 68.41 and a standard deviation of 12.69, with a pre-test, post-test mean gain of 49.96. Also, male students taught with the SRL approach had a Mean score of 22.91 and a Standard Deviation of 38.47 in the pre-test and a Mean score of 64.89, and a Standard Deviation of 13.39 in the post-test making a pre-test, post-test Mean gain in the male students of 41.98. At the same time, female students who taught furniture craft with SRL approach had a mean score of 20.16 and Standard Deviation of 12.93 in the pre-test and a Mean score of 70.41 and Standard Deviation of 12.69 in the post-test making a pre-test, post-test Mean gain in the female students of 50.25. With these results, female students who taught furniture craft with AL approach and SRL approach had higher posttest mean scores than male students in the psychomotor achievement test. Therefore, there is an effect attributed to the gender on students' psychomotor achievement in furniture craft.

Hypotheses

H_{01} : There is no significant difference between the mean effect of self-regulatory learning and active learning approaches on students' psychomotor achievement in furniture craft.

H_{02} : There is no significant difference between the mean effect of gender on furniture craft psychomotor achievement of students (male and female) using self-regulatory learning and active learning approaches.

H_{03} : There is no significant mean interaction effect of treatment given to students using self-regulatory learning and active learning approaches and their gender (male and female) to their mean scores in furniture craft psychomotor achievement test.

Summary of Analysis of Covariance (ANCOVA) test for hypotheses 1, 2 & 3 is presented in Table 3 below.

Table 3 : Summary of Analysis of Covariance (ANCOVA) for Test of Significance of Effect of Treatments (AL, SRL), their Gender and Interaction Effect to their Mean Scores on Furniture Craft Psychomotor Achievement Test

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	8067.097 ^a	17	474.535	17.619	.000
Intercept	195187.985	1	195187.985	7246.973	.000
METHOD	5593.886	9	621.543	23.077	.000
GENDER	13.708	1	13.708	.509	.017
GENDER * METHOD	337.642	7	48.235	1.791	.097
Error	2801.108	104	26.934		
Total	373893.000	122			
Corrected Total	10868.205	121			

a. R Squared = .742 (Adjusted R Squared = .700)

*Significant at sig of $F < .05$

Table 3 shows F-calculated values for three effects: treatment (AL and SRL), gender, and interaction of treatment and gender on students' psychomotor achievement in woodwork technology. The F-calculated value for treatment is 23.079 with a significance of F at .000 which is less than .05. Hence, the null hypothesis of no significant difference between the effect of treatments (AL approach and SRL approach) on students' psychomotor achievement in furniture craft is, therefore, not accepted at a .05 level of significance. This means that there was a significant mean difference between the effect of the AL approach and the SRL approach on students' psychomotor achievement in furniture craft. The F-calculated value for gender is .509 with a significance of F at .017. Since the F-calculated value is less than the Significant F-value, the null hypothesis is, therefore, rejected at a .05 level of significance. This result means that there was a significant effect of gender in favour of females on students' psychomotor achievement in furniture craft. The interaction effect of treatment and gender has an F-calculated value of 1.791 with a significance of F of .097 which is higher than .05. Therefore, the null hypothesis of no significant interaction effect of treatments given to students taught with AL approach and SRL approach and their gender to their mean scores

on furniture craft psychomotor achievement test is accepted at .05 level of significance. This, therefore, means that there is no significant interaction effect of treatments given to taught with AL approach and SRL approach and their gender to their mean scores on furniture craft psychomotor achievement test

Discussion of the Findings

The purpose of this study was to determine the effects of challenge-based and activity-based learning approaches on technical college students' achievement, interest, and retention in woodwork technology as well as their effect on gender. The findings that have emerged from the study are hereby discussed.

The data presented in Table 3 provided an answer to research question one. It was revealed that the learning model and intelligence learning model are effective in improving students' psychomotor achievement in furniture craft, but the effect of AL and SRL in improving students' psychomotor achievement in furniture craft is higher than SRL. The result indicates that AL is more effective in improving students' psychomotor achievement in furniture craft. However, analysis of covariance was used to test the three hypotheses (Table 3) at the calculated F-value (23.077), the significance of F (.000), and confidence level of .05. It was revealed that the mean difference between the effect of AL and SRL on students' psychomotor achievement in furniture craft was not statistically significant. Hence, the null hypothesis of no significant mean difference was not accepted. The result means that there was a significant mean difference between the effect of AL and SRL on students' psychomotor achievement in woodwork technology.

The result of this study regarding students' psychomotor achievement could be explained by the fact that teachers' adoption of authentic instructional techniques in the learning group, where visual aids (e.g. woodwork Technology were not only used to address students' visual-spatial intelligence but also used in the development of reasoning strategies and development of effective self-directed learning strategies) engaged the students in higher-order thinking tasks such as analysis synthesis and evaluation. This improved the student's problem-solving abilities in woodwork Technology. Gimbaet *al.* (2014) noted that authentic instruction fosters higher-order thinking skills in students. He explained that higher-order thinking requires students to manipulate ideas in ways that transform their meaning and applications. The manipulation of information and ideas allows students to discover a solution to problems (Afolabi & Akinbobola 2014). It implies that students in this group could have problem-solving skills etc. In addition, practical activities in the AL group, aimed at addressing and developing students' skills, consequently, improved students' technological understanding by applying theoretical principles to real-life situations. This, therefore, also enhanced their manipulative skills and mastery of problem-solving strategies which led to their considerable psychomotor achievement.

The data presented in Table 2 provided an answer to research question two. Findings revealed that the mean score of females was higher than the mean score of males in the psychomotor achievement test. The finding was contrary to the study of Owoso (2010) in which the male students outperformed the female students in Auto mobile technology.

Research has shown that, on general measures of intelligence, the sexes perform about equally the same. Also, Udofia (2008) emphasized that there are more similarities than differences between the cognitive abilities of males and females. Similarly, Eze (2009) maintained that there are no genetically based differences between male and female students in their ability to learn. Therefore, it is unlikely that gender differences in academic achievement are explained by biological differences, if biology were the reason, girls would not have improved significantly in certain subjects (such as math and science) where boys used to outperform girls traditionally, in the past two decades. However, findings of the present study with regards to gender achievement in woodwork Technology confirm the findings of Iwendi & Oyedum (2012) and Oviawe (2010) who, in their separate studies in other vocational subjects, found out that male and female students have no significant difference in cognitive achievement.

Conclusion

This study determined the effects of self-regulatory learning and active learning approaches on technical college students' psychomotor achievement in furniture craft. The active learning approach used in this study greatly affected the students learning of furniture craft. This was reflected in the student's psychomotor achievements. In other words, students learned furniture craft and psychomotor skills better because they were allowed to participate actively in the classroom teaching and learning by interacting with the teacher, learning environment, and their colleagues, work and learn together in groups. Also, students retained their learning for a longer time when they were allowed to think about possible solutions to a problem while engaging in practical activities with real objects, tools, and machines collaboratively. It is hoped, therefore, that if the active learning approach is taken into consideration in the teaching/learning of furniture craft in the Technical Colleges, craftsmen trained will graduate from the Technical Colleges with knowledge, psychomotor skills, strong problem-solving skills, creative thinking, collaborative work, and independent decision-making skills will make them adaptable to the present and envisaged changes in the furniture construction industries occasioned by technological advancement.

Recommendations

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

1. Technical College teachers should adopt the use of an active learning approach to the teaching of furniture craft.
 2. National Board for Technical Education (NBTE) should consider a review of the curriculum for the furniture craft programme to incorporate the active learning approach into the teaching of furniture craft.
 3. Government should provide the tools and equipment needed to teach the state-of-the-art of furniture craft in the Technical Colleges.
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