EFFECT OF JIGSAW INSTRUCTIONAL METHOD ON THE ACADEMIC PERFORMANCE OF B.ED (TECH.) STUDENTS IN BUILDING TECHNOLOGY EDUCATION IN TERTIARY INSTITUTION IN LAGOS STATE.

***Omoh D.,** Department of Geoscience, University of Lagos, Akoka-Lagos.
Email: domoh95@yahoo.com. and ****Banjoko, O.M.** Department of Building Technology, Federal college of Education (Technical), Akoka-Lagos, Email:banjokomosesolusola@yahoo.com

Abstract

More often than not, the major challenge teachers encounter regularly in any classroom environment is the problem of finding appropriate instructional method that would not only enhance the teaching-learning process, but also cater for the students' individual differences, enable acquisition of relevant skills, and more than anything else, understand the subject matter. In Technical and Vocational Education and Training (TVET), the acquisition of relevant knowledge and skills cannot be over emphasized, hence the paper attempted to study the effect of Jigsaw Cooperative learning technique against the lecture method in enhancing students' academic performance in Engineering/Technical drawing as a subject in Building Technology program at University of Benin (Federal College of Education Technical Campus) and University of Lagos Akoka. The purpose of the study is to assess the effectiveness of Jigsaw instructional method against the lecture method of teaching in enhancing the academic performance of students in Assembly drawing process. The pre-test post-test equivalent method was employed for the study, using the quasi experimental design. The result was analyzed using t-test and Analysis of Covariance (ANCOVA). Findings revealed that the group of students assigned for Jigsaw Method of instruction achieved significantly higher mean score than those assigned to the lecture method of teaching. The performance of Male and female Students in Jigsaw method group achieved higher mean scores in the Achievement test than that of the male and female students assigned to lecture method of teaching. There was also interaction effect of the teaching method and gender with the female students performing better than the male. It was recommended that Jigsaw method of instruction should be employed not only in teaching Engineering/Technical drawing course students but at all levels of education.

Keywords: Jigsaw instructional method, lecture method, collaborative, interactive, academic performance, gender

Introduction

BackgroundtotheStudy

Education involves all the processes by which a recipient develops the abilities, attitude, and values including acquisition of knowledge, and development of skills that could lead to right attitude and usefulness in the society. Hence, it remains the single factor that guarantees both individual growth and community development. According to Omoregie (2018), the concerns of education are teaching and learning for acquisition of theoretical and practical knowledge, hence the learner must be the nucleus of every Educational enterprise and learning must be the main objective whether in the basic (lower and upper), senior secondary, and tertiary institution. The Federal Republic of Nigeria National Policy on Education (FRN, 2014) stated that the major goal of education is the acquisition a n d development of mental, physical, and socialabilities, plus relevant skills so that recipients can contribute meaningfully to the development of the society and nation at large in this 21st century. This type of education is Technical, Vocational Education, and Training (TVET).

TVET as an aspect of Education, is not only designed to enable recipients (boys and girls) to be interested in science and technology and become useful in the society, but a lifelong learning that provides for individuals' survival and socio-economic wellbeing of the society and nation building by taking cognizance of skill empowerment capabilities for job creation and poverty reduction

(Ogbuanya & Izuoba, 2015). United Nations Educational Scientific and Cultural Organisation (UNESCO) (2015) stated that TVET is all forms and levels of the educational process involving, in addition to general education, the studyof technologies and related sciences and the acquisition of practical skills, and knowledge relating to occupation in various sectors of economic life in orderforthe graduates to be come self-reliant and even employer of labour. UNESCO stressed further that TVET includes workbase learning, continuing training and professional developmentwhich may lead to qualifications. Hence Uwameiye (2010) stated that with quality TVET, recipients irrespective of gender (boys and girls), wouldacquirebroadknowledge of science and technology ina broad occupational are a requiring technical and professional competences and specific occupational skills, so national TVET system must be able to address bias and develop the knowledge and skills that will help the work force become more flexible and responsive to the needs of local labour market while competing in the global economy.

Gender factor according to Oviawe (2010) has assumed prominence in Technical, Vocational Education and Training (TVET) discourse and it has been documented that disparityexists between male and female students academic performances invarious disciplines and that the trend now is for people to pay attention to educating the female child in Nigeria. Hence, Nurhaeni and Kurniawan (2018) emphasised that gender differences should be considered to TVET programmes for them to develop their potentials without being inhibited by gender bias. To this end, Obafemi (2015) proposed that instructional methods which are student centred and interactive can effectively promote gender equity in educational programmes, otherwise the purpose of TVET may not be achieved.

Instructional methods are educational approaches or strategies which are applied by teachers in order to transform knowledge into learning and enhance the students'academic performance, while academic performance according to Steinmayr, Meibner, Weidnger, and Wirthwein (2017) represents performance outcomes of students using their grades or score in examinations that indicates the extent to which a person has accomplished specific goals that were the focus of activities in an instructional environment, specifically in Schools, Colleges, and Universities. Pooja (2017) stated that there are different types of instructional methods such as teacher-centred lecture method, and student centred method which involves interactive and collaborative learning process.

Lecture method according to Woldeamanuel, Abate, and Berhan, (2020) preferred by most lecturers encourages students' to replicate facts without actually understanding the topic and unsurprisingly fails in the face of multifaceted interactions involved in technical knowledge and practical skills. In lecture method lecturers teach students mostly using ''talk and chalk'' method, which comprises drawing and writing notes on the chalk-board and students' just copy on their notebook and are overburdened with facts but does not: (i) stimulate students in their learning to construct knowledge; (ii) understand scientific ideas thoroughly; (iii) acquire technical knowledge; and (iv) develop relevant skills for work after graduation.Henceit has been adjudged ineffectiveto teach technology and technical subjects.

According to Ezenwosu & Nworgu, (2013) lecture method is inappropriate for teaching practical skills, calculation and drawing subject like engineering/technical drawing because it is a strategy that is concerned with how much ground is covered by the teacher before examination and this make it attractive to most teachers but not helpful to effective learning in technical education courses. They posited further that interactive and collaborative learning environment such as jigsaw instructional method leads to: (i) students being tolerant of diverse viewpoints; (ii) sharing of ideas and making knowledge discovery; (iii) considering others' thoughts and feelings in depth; (iv) seek more support and clarification of others' positions, irrespective of the ethnic or religious background of the other person (v) acquisition of relevant skill needed for work place after graduation

Hence Whenham (2021), emphasized that an interactive and collaborative based classroom encourages: (i) development of collaborative skills; (ii) risk taking in order to achieve desired goals in learning; (iii) increases engagement, interest and effective participation in learning; (iv) improves

critical thinking skills (v) increases knowledge retention; (vi) sparks creative thinking, and; and (vii) promote real problem solving skills as they interact.This type of instructional method that enhances academic performance, develop students' relevant skills and abilities as they interact in a collaborative based classroom is the Jigsaw instructional method.

Jigsaw instructional methodisateachingapproachthatiscontrarytothe lecture method as it: (i) encouragesstudents group learning activities. It enables each studentof a group to specialize and take responsibilityof one aspect oflearning unit, master it and teach it to the group; and (ii) helps to findsolutiontoanacademicassignment or class project. The result was considered to be very effective in enhancing students' educational learning. The arrangement is such that students are made member soft wodifferent groups called the ''home group and expert group''. They would first gather as home group, and each member of the home group isa ssigned aportionofthesubjectmattertolearnin order to become an, "expert" in that subject matter(Slavin, 2014).Then the ''home groups''are brokenupandone person from each of the broken group are brought together like pieces of a jigsaw puzzle to form the''jigsaw group'' which consist of ''experts''from each ''home group''who have been assigned some portion of the subject matter in the topic and would have been equipped with an in-depth knowledge of that subject matter that is to be taught.Then each student from among the ''jigsaw group''now goes back to their "homegroup", to teach what they have learnt, whiletheteacher facilitates and guides the process. This method of teaching strategy helps students to develop (I) competencies for social and economic life, and (ii) achieve significant learning; and (iii) acquire relevant skills necessary for work after graduation, thus achieving the objectives of TVET.

The objectives of Building Construction Technology may be difficult to achieve due to inhibitions posed by the current lecture instructional methods that is passive and not students centred and can enhance academic performance and skill acquisition, hence the concomitant effect of such instructional methods is not only poor academic performance in Building Technology, but the set objectives ofthe programme may not also beachieved.If TVET is going to be relevant in this ever changing technological world, then there must be a paradigm shift of instructional methods from teaching to learning and from the current lecture method to an interactive and collaborative based classroom so that recipients academic performance can be enhanced and be also equipped with relevant skills to enable them find space in the current technological world of work.

According to Suresh and Reddy (2017) the good teaching is explaining, informing, initiating, directing, administering, unifying the group, giving security, clarifying, diagnosing, learning problems, preparing curriculum material, evaluating, recording, reporting, enriching community activities, organizing and arranging classrooms, participating in school activities and in professional development. In this teacher -centered learning process, the students used to adopt rote learning and reproducing the same content material of what they memorized in their examinations for better marks and better grades. The individual difference in a heterogeneous classroom is completely ignored, hence measures must be put in place to cater for the different needs of the students, which can be resolved in Jigsaw method of teaching.

According to Francis (2013), the Jigsaw teaching technique enables students with individual differences to work together, interact and achieve learning in many ways and at levels that are rarely found in other instructional strategies, while Jimoh (2014) stated that to enhance students' academic performance, teaching methods that emphasize student's active involvement and give opportunities to communicate, interact, reason and develop self-confidence to solve problem at all levels of learning especially in the sciences and technology are required (Jimoh, 2014). Engineering/Technical drawing is one of the subjects taught at the year three level in the Building Construction program involving involute, development of solid shapes, lines in space, isometric, orthographic, cam and cam follower and assembly processes.

Statement of the Problem

The importance of TVET programmes in this era of changing technology cannot be over emphasized.In assuming that the conventional teaching methods are still sufficient with respect to acquiring relevant

skills, understanding the subject matter and meeting the current learning needs of the students cannot be correct because it is not student-centred but contentdriven, where learning is passive and memorization of subject matter is encouraged.Hence,it is of utmost importance that the method must change so that the decline of academic performance of the students and development of practical and interactive skills for workplace after graduation can be addressed. Remarkably, these poor teaching methods adopted byt eachers have also been identified bycertain researchers (Adunola, 2011; Oviawe, Ezeji & Uwameiye, 2015; Oviawe & Adeola, 2017; Atsumbe, Owodunni, Raymond &Uduafemhe, 2018) asone of the major factors contributing to poor academic performance of students in school subjects.These studies indicate that the persistent use of the lecture method which does not promote insightful and interactive learning intechnical which has become a challenge to students' performance. Therefore, the use of ineffective non-innovative and non-student centred instructional method may have resulted in students performing poorly in engineering/technical drawing processes course.

Purpose of the study:

*The specific purpose of this study is to determine:

1. the effect of Jigsaw instructional method as compared with the Lecture method on the academic performance of B.Ed Technology year three students in Engineering/Technical drawing Process.
2. ascertain the effect of Jigsaw and lecture method of instruction and gender on the academic performance of Year III students in Building Construction Technology by gender.

Research Question

1 What is the effect of Jigsaw method of instruction on the academic performance of Year III students in Building Construction Technology as compared with those taught using lecture method?

2 What is the effect of Jigsaw and Lecture method of instruction and gender on the academic performance of Year III students in Building Construction Technology by gender?

Hypothesis of the Study

1. There is no significant difference on the academic performance of Year III students taught with the Jigsaw method of instruction as compared with those taught using the lecture method of teaching.

Methodology

Quasi experimental design was used in carrying out the study. The design enabled the researcher to collect detailed and factual information and employed pre-test post-test equivalent method that helps with the effective usage of jig saw teaching method in tertiary institution in Lagos state. The total number of students was 47 with 15 girls and 32 boys. All the year three students from both Universities were used for the research study.

Distribution of the students into the different groups were done using their class attendance register such that numbers one to three were assigned to one group, then three to six assigned to the other group until they were all assigned to the control group and experimental group. Pre-test and Posttest was employed to acquire data for the study. The researcher developed the Assembly drawing Achievement Test which was administered to both control group and experimental group. A score of above 50 is considered as good performance. The researcher distributed and collected the copies of questionnaire and administer the pre-test and post-test to the students with the help of six research assistants who gather and collate questions for analysis.

Data was analyzed using ANCOVA to look at interaction effect and t-test to differentiate the means.

Results

Research question 1: What is the effect of Jigsaw method of instruction on academic performance of students as compared with those taught using lecture method?
The result is seen in Table 1

Table 1 Jigsaw method of instruction and academic performance of students

Teaching Method	N	Pre-test			Post-test	
		Mean	Std. Deviation		Mean score	Std. Deviation
Jigsaw	25	14.24	1.45		68.72	7.11
Lecture	22	13.59	2.06		36.32	4.25

In table 1, the result of the pre- test mean score shows no significant difference between the experimental group scoring 14.24 with standard deviation of 1.45 while the control group scored 13.59 with standard deviation of 2.06 before the treatment. However, in the post test, the mean score results shows significant difference between the experimental group and the control group.. The mean score for the experimental group is 68.72 with standard deviation of 7.11 indicating better performances, while the control group has a post test score of 36.32 with standard deviation of 4.25 indicating poor performance showing significant difference in the mean scores.

Hypothesis 1: There is no significant difference on the academic performance of the posttest mean score of year 3 students taught with the Jigsaw method of instruction compared with those taught using the Lecture method. The result for the hypothesis is seen in table 2 below

Table 2: Significant difference on the academic performance of the posttest mean score of year 3 students taught with the Jigsaw method of instruction compared with those taught using the Lecture method.

	t	*Df*	Sig. (2-tailed)	Mean Difference
Post test	18.64	45	0.000	32.40
Pre-test	1.26	45	0.214	0.65

Table 2 shows that the t-value for the post-test is 18.64 with a 0.000 score below the 0.05 significant value, while the t-value for the pre-test shows 1.26, with a 0.214 score above the 0.05 significant level. This indicates also that those taught with Jigsaw instructional method performed better than those taught with the lecture method. Thus, the hypothesis of no significant difference is rejected.
Research Question 2: What is effect of Jigsaw method of instruction on the academic performance of male and female Year III students in Electrical and Electronics Technology as compared with those taught using lecture method.

Table 3: t-test independent statistics

Teaching Method	Gender	Mean Score	Standard Deviation	T	Sig	Mean Difference
	Male (32)	55.52	20.80			
	Female (15)	69.40	31.90			

Table 3 *: Results from table 3 also confirms that there was interaction between teaching method and gender with t-value of 1.47, and a Mean difference of 16.87 at 0.033 level of significance. The female students score 69.40 with a standard deviation of 31.90, while the male scored 55.52 with standard deviation of 20.80. This shows that the females interacted more and performed better with Jigsaw method than the male students.

Interaction effect between Teaching Method and Gender

The result for the interaction is seen in Table 4 using ANCOVA.

Table 4: Interaction effect between teaching method based on gender

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	12658.384[a]	4	3164.596	55.094	.000
Intercept	1514.759	1	1514.759	26.371	.000
Pre	21.562	1	21.562	.375	.547
Teach	8360.422	1	8360.422	145.552	.000
Gen	397.366	1	397.366	6.918	.016
teach * gen	366.502	1	366.502	6.381	.020
Error	1206.232	21	57.440		
Total	68330.000	47			
Corrected Total	13864.615	46			

Table 4 result shows that there was interaction between teaching method and gender at F value of 6.38 and significant level of 0.020 less than 0.05 level of significance.

Discussion

The results from research question one show no significant difference between the control group scoring 13.59 with standard deviation of 2.06, and experimental group scoring 14.24 with standard deviation of 1.45 before the treatment. However, in the post test, the mean score results shows significant difference between the control group and the experimental group. The mean score for the control group is 36.32 with standard deviation of 4.25 indicating poor performance while the mean score for the experimental group is 68.72 with standard deviation of 7.11 showing significant difference, indicating better performances. This is in agreement with the findings of Ezenwosu and Nworgu (2013) who maintained that lecture method is inappropriate for teaching practical skills, calculation and drawing subject like engineering/technical drawing because it is a strategy that is concerned with how much ground is covered by the teacher before examination and this make it attractive to most teachers but not helpful to effective learning in technical education courses.

The result on hypothesis one shows that the t-value for the pre-test is 1.26 with a significance 0.214 score above the 0.05 set level of significance, while the t-value for the post test shows 18.64, with a 0.000 score below the 0.05 set of level of significance. This indicates also that those taught with Jigsaw cooperation method performed better than those taught with the lecture method. Thus the hypothesis of no significant difference is rejected. This is in line with the findings of Whenham (2021) who emphasised that interactive and collaborative based classroom encourages development of collaborative skills; risk taking in order to achieve desired goals; increases engagement, interest and effective participation in learning; improves critical thinking skills; increases knowledge retention; sparks creative thinking, and; and promote real problem solving skills as they interact.

The result from research question two on gender and academic performance also confirms that there was interaction between Jigsaw instructional method and gender with t-value of 1.47, and a Mean difference of 16.87 at 0.033 level of significance. The female students scored 69.40 with a standard deviation of 31.90, while the male scored 55.52 with standard deviation of 20.80. This shows that the female students interacted more and performed better with Jigsaw method than the male students. The performance of Male and female Students in Jigsaw method group achieved higher mean scores in the Achievement test than that of male and female students assigned to lecture method of teaching. There was also interaction effect of the teaching method and gender with the female students performing better than the male. The finding from the result shows that there was interaction between teaching method and gender at F value of 6.38 and significant level of 0.020 less than 0.05 level of significance. This is in consonance with Obafemi (2015) who proposed that

instructional methods which are student centred and interactive can effectively promote gender equity in educational programmes, otherwise the purpose of TVET may not be achieved.

Conclusion

It is seen that Jigsaw method of instruction which is student centered and the Lecture method that is teacher centered adjudged as passive should be combined to enhance students' academic performance. This better performance can be due to the cooperation among the students where they have to share ideas as they interact with one another.

Recommendation

It was recommended that Jigsaw method of instruction should be employed not only in teaching Engineering/Technical drawing course students even at all levels of education. Teachers and stakeholders in the educational sector should allow trainings on the use of different interactive learning process in order to enhance students' acquisitions of relevant skills and practical knowledge especially in TVET programmes.

References

Adunola, O.(2011). *The impact of teachers‟ teaching method son the academic performance of primary school pupils in Ijebu-Ode Local Government Area of Ogun State* Identification No:20, File No:2011122213, Published Online By: Ego Booster Book.

Atsumbe, B, Owodunni, S., Raymond, E. & Uduafemhe, M. (2018). Students‟ achievement in basic electronics: Effects of scaffolding and collaborative instructional approaches. *EURASIA Journal of Mathematics, Science and Technology Education*, *14 (8):em1563*

Ezenwosu, S. U & Nworgu, L. N.(2013). Efficacy of peer tutoring and gender on students' achievement in Biology. *International journal of scientific research*, *4*(12), 944- 950.

Federal Republic of Nigeria (2013). *National Policy on Education.*Lagos: NERDC

Francis, H.A. (2013). Using Jigsaw Technique as an Effective Way of Promoting Co-operative Learning Among Primary Six Pupils in Fijai. *International Journal of Education and Practice, 1*(6), 64-74.

Jimoh, A. G. (2014). Effect of cooperative learning method on academic achievement of cost accounting students in colleges of education in Ogun State: *Unpublished M.Ed thesis,* Department of Vocational Teacher Education, University of Nigeria, Nsukka

Nurhaeni, D.A. & Kurniawan, Y. (2018). Gender-Mainstreaming in Technical and Vocational Education and Training. *IOP Conference Series: Materials Science and Engineering 306, 013057* (pp. 2-6)

Obafemi, D.T.A., (2015). Bridging gender gap in the physics classroom: the instructional method perspective. *Journal of Education and Practice, 6*(20), 24-40.

Ogbuanya T.C. & Izuoba, P. (2015).Repositioning technology andvocational and training (TVET) for poverty reduction in Nigeria. *International Journal of African Society, Cultures and Traditions, 2*(3), 1-12*.*

Omoregie E.O. (2018) Organization behavior in the business of education: The seed and the sowers; for richer or for poorer? *Inaugural Lecture, Ambrose Ali University, Ekpoma, Edo State, Nigeria.*

Oviawe, J.I. (2010). Differential effect of three instructional methods on students performance in building technology in Polytechnics in Nigeria. Ph.D Thesis, UNN, Nsukka.

Oviawe, J.I. & Adeola, L. (2017). Effects of concept mapping instructional strategy on students‟academic performance and interest in technical drawingin technical colleges in EdoState, Nigeria. *IOSR Journal of Research and Method in Education, 7(3), 9-15*.

Oviawe, J.I. Ezeji, S.C.O.A., & Uwameiye, R. (2015). Comparative effectiveness of three methods on the academic performance of students in building technology in Nigeria Polytechnics. *European Scientific Journal, 11(12), 274–285.*

Slavin, R.E. (2014). Cooperative learning and academic achievement: Why does groupwork work? *Annals of Psychology, 30*(3)785-791.

Steinmayr, R., Meibner, A., Weidinger, A.F. &Wirthwein, L. (2017). *Academic achievement*, Oxford Bibliographies.

Suresh, C. & Reddy, V.D. (2017). Effect of jigsaw cooperative learning strategy in promoting insightfull earning of junior intermediate students in mathematics.*The International Journal of Indian Psychology,* 4(2), 1-7

United Nations Educational Scientific and Cultural Organization (UNESCO) (2015) RecommendationConcerning TVET, General Conference of UNESCO, 38th Session, Paris. UNESCO.ORG.

Uwameiye, R. (2010). *Essentials of technical and vocational education*, Benin City, Ambik Press. Whenham, T. (2021). Benefits of active Learning: Why your college should try it. Education Blog /NU.

Woldeamanuel, W.Y., Abate, N.T., & Berhane, E.D (2020). Effectiveness of concept mapping based teaching methods on grade eight students conceptual understanding of photosynthesis at Ekwet Fana Primary School, Bahir Dar, Ethiopia. *Eurosia Journal of Mathematics, Sciences and Technology Education, 16*(12), 1918-29.