

Effects of Jigsaw Teaching Method on Students' Performance /Proficiencies in Cataloguing and Classification Course

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Abstract

This study adopted a quasi-experimental design, specifically pre-test, post-test, on-equivalent control group, to investigate the effect of jigsaw teaching method on students' performances/proficiencies in cataloguing and classification course. The population of the study is one hundred and five (105) second year library and information science students in government universities in Anambra State. A sample of 45 second year library and information science students was drawn by simple random sampling technique from the government universities in Anambra State, Nigeria. Two research questions and one hypothesis guided the study. The instrument was Cataloguing Achievement Test (CAT) made up of 27 items. The instrument was validated by two experts and it obtained a reliability coefficient of 0.86 after being tested with the use of Kuder Richardson K-R21 correlation. Data collected were analysed using mean and standard deviation for answering the research questions and ANCOVA for testing the null hypotheses at 0.05 level of significance. The result of the data analysis showed a significant difference in the mean achievement scores of students taught with jigsaw (experimental group) and lecture methods (control group) in favour of the experimental group. Thus it was recommended among other things, that lecturers should adopt the use of jigsaw teaching method in classroom instruction in order to enhance students' academic achievement in cataloguing and classification course.

Keywords: Jigsaw teaching method, Library and information science students, Academic achievement, Cataloguing and Classification course, Effects.

Introduction

Cataloguing and classification (CAT and CLASS) course which is also known as organization of knowledge or information organization is one of the core courses of library and information science programme in tertiary institutions in Nigeria. The inclusion of cataloguing and classification course in tertiary institutions curriculum in effect means that every student of library and information science should have the opportunity to study the course and be used to cat and

class practical class. It is one of the library and information science courses offered by students in Polytechnic, Colleges of Education and Universities. It is the heart of library and information science education. It is a well-known fact that no student of library and information science department can succeed in studying other library and information science courses successfully without studying cataloguing and classification course.

When it comes to curriculum relevance, students feel anxiety toward cataloguing, and this anxiety affects their

academic achievement in cataloguing, students who lack confidence in cataloguing are less successful despite being in tertiary institutions for three years. Thus cataloguing and classification course is an essential process that provide access to all acquired information resources of the library for it allows people to find the needed information resources for their personal and professional growth and development (Adamu,2018). He further opined that it provides access points to information resources in a way that users will be able to find the need information or resources.

However, despite the importance of cataloguing and classification course to the individual and the society, literature review constantly reveals persistent poor academic achievement at all levels. In the bid to curb poor academic achievement in cataloguing and classification course, many researchers (Okoye and Nwankwo,2016) advised the use of teaching methods such as cooperative learning such as jigsaw, in the teaching of cataloguing and classification course. Students' academic achievement at semester exams had been very poor especially in the area of practical aspect of cataloguing. However, Adamu (2018) in his work reported that traditional teaching method of cataloguing and classification employed by the lecturers make it boring to the students thereby, creating negative motion towards the courses ((classification and classification). He further reported that some students still have negative attitude towards cataloguing and classification course despite their major role play in librarianship activities.

Iwhiwhu (2022) opined that the major problems militating against Library and Information Science undergraduates' study of cataloguing and classification are lack of cataloguing/classification laboratory, outdated teaching methods, inadequate time allocated for the teaching and practical learning of cataloguing/classification course. He recommended that lecturers should strategize in their teaching methods so as to arouse interest in students for learning cataloguing and classification course in their training rather than studying to pass examinations.

Many researchers like Okafor, Nwike, Chukwuma, Ogugua and Ugwuezi (2018) agree that the conventional method does not help students to construct their own understanding and opined that the unaspiring teaching methods adopted by teachers lead only to low performance but also incapacitates students from developing required skills necessary for creative thinking. However, the conventional method can work for the students in other fields, not library and information science students. Researchers believe that in the lecture method, freedom of students is reduced and processes are lacking. Lecture method is known to cause paucity of students' participation, lack of interest and poor academic achievement in sciences.

Academic achievement is the learning outcomes of the students which can be measured by any form of assessment technique to ascertain academic gain of the students (Simiku and Oru,2016). Poor academic achievement of students in cataloguing and classification course can be

improved with innovative instructional strategy integrated with technology and demonstration approach. Evolving a more effective method for teaching cataloguing and classification course in Nigerian universities to enhance students' academic achievement becomes imperative. One example of an active teaching method is a cooperative teaching method known as jigsaw.

As a form of cooperative learning, the jigsaw method is a teaching strategy that helps students to develop skills for working effectively in teams, an important competency for socio-environmental synthesis (S-E synthesis) (Micheal,Yakubu and Abdullahi,2022). They further opined that jigsaw cooperative learning strategy have been used to improve learning outcomes in other subjects with relative success. Jigsaw method here referred to the cooperative learning strategy designed to develop teamwork and cooperative learning skills within all students for the accomplishment of a specific or shared goals through students working together in groups and interacting with each other in the group. Firestone, (2021) described "Jigsaw thus: as a teaching method where the main goal is for students to teach each other about a given topic, learn about jigsaw activities, discover the classroom applications of this method and some important tips to apply it, and explore an example to see how to do a jigsaw activity. Firestone further opined that a jigsaw activity is a cooperative learning technique where students work in groups to teach each other something. She further opined that the groups are given an overall assignment and each student in each group becomes an 'expert' on a smaller part of it. When each student has taught what he/she knows to another group member, they have together learned the overall assignment and completed the jigsaw. What makes this strategy so effective is that group members work together as a team to achieve a common goal (Yakubu,2016).

Jigsaw is a learning method and right approach for students as it is an effective teaching method. Also, jigsaw method was propounded by a Professor named Elliot Aronson in 1971 in Austin, Texas. He started it with concept of division of labour among the individual group members. Here each student is responsible for completing a task and teaching the task to the rest of the group. The jigsaw method of teaching is a collection of topics, which will be fully developed by students before coming together to make a complete idea (Hance,2016). Students meet with members from each home group who are assigned the same aspect, and after mastering the material, return to the "home" group and teach the material to their group member and get prepared for peer tutoring and individual test.

Gender refers to all the characteristics of male and female which describes behaviours or attributes expected of individuals on the basis of being either a male or female in a given society (Simiku and Oru,2016). Gender is one of the factors identified as influencing students' academic achievement in sciences at tertiary institution level. However, Nwosu and Ndanwu (2020) reported that females

performed better than male when taught electronic libraries using computer aided instruction. Contrarily, On the other hand, Simiku and Oru (2016) reported that gender had positive effects on achievement of students in dialogic learning method. These contradicting results here called for inclusion of gender as the moderating variable for this study.

It is imperative to state that if teachers of cataloguing and classification course in tertiary institutions adopt jigsaw instructional methods in teaching. It will produce much greater positive effects on the learners' academic achievement than continuing with traditional teacher centred method of teaching. Thus, this study sought to investigate the effects of jigsaw method of teaching on students' academic achievement in cataloguing and classification course in tertiary institution in Anambra State, Nigeria.

Statement of the Problem

The consistent decline in the academic achievement of students in cataloguing and classification course in Nigerian tertiary institutions is the major problem that prompted this study. Prominent among the library and information science courses at the tertiary institution level is cataloguing and classification course. Therefore, it is expected that Nigeria government, tertiary institution management etc, should do the needful such as employing appropriate instructional methods that will suit the students learning ability, employing and training competent cataloguing and classification course lecturers to address the problem of consistent decline in cataloguing and classification course. This implies that for effective study of cataloguing and classification course, lecturers have to select appropriate instructional methods that have been empirically found effective in some concepts other than library and information science in cataloguing and classification course. One of such techniques is the use of jigsaw (JTS). However, there is evidence in literature that cataloguing and classification classrooms are dominated with traditional teaching methods which make students passive recipients in the teaching and learning process. Hence, the problem posed by this study is what are effects of jigsaw teaching method on academic achievement of students in tertiary institution in cataloguing and classification course in Anambra State? It is in an attempt to provide answers to this question that the authors embarked on this research.

Purpose of the Study

1. Determine the effect of Jigsaw method of teaching on academic achievement of tertiary institution students in cataloguing and classification course
2. Determine the effect of jigsaw teaching method on the academic achievement scores of male and female cataloguing students.

Research Questions

1. What are the mean achievement scores of students taught the concept of cataloguing and classification course using jigsaw teaching methods and those taught using lecture method?
2. What is the effect of gender on the mean achievement score of students' exposed to jigsaw?

Hypotheses

The following null hypotheses were formulated to guide the study and were tested at 0.05 level of significance.

1. There is no significant difference in the mean achievement scores of students taught the concept of cataloguing and classification course using jigsaw teaching method.

Review of Related Literature

Cataloguing is the process of providing bibliographic details of library materials like books, journals, maps, and compact disc for easy and fast retrieval (Etubi and Jimoh, 2017). They further opined that the bibliographic details of a library material include the author, title, publisher, place and date of publication. Cataloguing and classification are processes involved in describing, organizing and providing access to all information materials available in a library or groups of libraries (Quadri and Olaleye, 2017). They further opined that Cataloguing refers to an act of physically describing books and non-book materials pointing out important bibliographic information about the materials. The subject could be Arabic, Literature, Economics, or Industrial Chemistry (Etubi and Jimoh, 2017). Various tools including Anglo American Cataloguing Rules, Resource Description, Access Tools, an index Language (which could be Library of Congress(LC) Subject Heading List, and Sears List of Subject Headings are used in the process (Quadri and Olaleye,2017). They further opined that it is important to students training in library and information science schools because it is an essential process in providing adequate access to learning resources in libraries and information centres.

The Jigsaw teaching strategy (JTS) is a method of organizing classroom activity that makes students depend on each other to succeed (Nwankwo and Okigbo, 2021). They further opined that jigsaw breaks a class into groups and breaks assignments into pieces that the group assembles to complete the puzzle, jigsaw, one of the cooperative learning techniques, is based on group dynamics and social interactions. Jigsaw method of teaching is a collection of topics, which will be fully developed by students before coming together to make a complete idea (Hance,2016). When students are given topics to develop before attending class for general discussion it is known as Jigsaw method. After researching

and developing their idea, each individual or small group then has the responsibility to teach it to the rest of the group or class(Hance,2016). In this way, every student learns every aspect of the problem (Michael, Yakubu and Abudulahi,2022).

Jigsaw is a strategy that emphasizes cooperative learning by providing students an opportunity to actively help each other build comprehension(AdLit,2022).According to AdLit(2022) jigsaw helps students learn cooperation as group members share responsibility for each other's learning by using critical thinking and social skills to complete an assignment(this strategy helps to improve listening, communication and problem-solving skills),Monitoring each students' participation within the groups provides teachers with information about how much the students already know about the topic(This allows teachers to tailor instruction accordingly)(AdLit,2022).

Jigsaw method was propounded by a Professor named Elliot Aronson in 1971 in Austin, Texas. He started it with concept of division of labour among the individual group members. Here each student is responsible for completing a task and teaching the task to the rest of the group. The jigsaw method of teaching is a collection of topics, which will be fully developed by students before coming together to make a complete idea (Hance,2016). Students meet with members from each home group who are assigned the same aspect, and after mastering the material, return to the "home" group and teach the material to their group member and get prepared for peer tutoring and individual test.

Also, a study by Micheal, yakubu and Abdullahi,(2022) on effects of jigsaw cooperative learning strategies on students' interest and performance in social studies in Taraba State, Nigeria revealed that there is significant difference in the mean performance scores of student in social studies taught using Jigsaw cooperative learning and conventional Strategies and there is significant difference in the students' mean interest scores in social studies taught using jigsaw cooperative learning and conventional strategies. The researchers concluded that Jigsaw cooperative learning Strategies is an effective teaching method, which social studies teachers should be encouraged to use and should be implemented in all teachers' education programmes in Nigeria and other African nations.

Academic achievement is defined as the students' learning outcome as measured from the cataloguing and classification course test. Achievement is the outcome of educational process in school, University and Colleges -the extent to which a lecturer (teacher), institution, and student (individual) has achieved their educational goal. Reduction in academic achievement of students is traceable to so many factors such as governments' poor funding of education; lack of qualified teachers; teaching methodologies employed by teachers; students' poor reading habit; poor conditions of service for teachers; lack of instructional facilities and equipment; lack of motivation; poor societal attitude towards education among others

(Ayomike, 2014; Emaikwu, 2012 cited in Ibeneme and Emeasoba,2017).

Gender issues in Nigeria today and LIS education in particular have remained a point of interest for a number of researchers. Literature show diverse views about gender and achievement especially in LIS. While some are of the view that males do better than females, others disagree with this view, arguing that achievement is a factor dependent on several factors such as socio-economic background, teaching method among others (Okeke,2015). Obviously, there seem to be more of female students in library and information science classes than males. Nevertheless, it is the researcher's opinion that the use of jigsaw instructions for cataloguing and classification will affect student's academic achievement uniformly and reduce score variations among Cat and Class students.

Teaching methods employed by lecturers in teaching may hinder or promote learning. Teaching method refer to a set of strategic activities adopted by the lecturer to develop learner skills, transfer knowledge, competencies and positive attitude aimed at turning the learner into a librarian upon graduation. For effective cataloguing and classification course teaching, the cataloguing and classification lecturers should adopt learner-centred teaching strategies/methods where the lecturer is mainly a facilitator of learning.

Academic achievement is the learning outcomes of the students which can be measured by any form of assessment technique to ascertain academic gain of the students (Simiku and Oru,2016). The academic achievement of students is of importance to various library and information science students. The poor trend in students' academic achievement in cataloguing and classification could be traced to ineffective teaching methods employed by the lecturers. Therefore, there can be no enhancement of student academic achievement in the tertiary institution without appropriate teaching method in learning which facilitate a better understanding of the subject matter. The advantages attributed to jigsaw method of teaching prompted the researchers to investigate the effect of jigsaw teaching on students' academic achievement in cataloguing and classification in Anambra State.

Method

The design is a quasi-experimental. Specifically, the pre-test, post-test non-equivalent control group design for the study. The population of the study is one hundred and five (105) second year library and information science students in government universities in Anambra State. A purposive sampling technique was employed to obtain two universities within Anambra State. This is because the researchers needed universities with well-equipped library laboratory and experienced Library lecturers. One university were used for the experimental group while the other university were used for the control group. Hence a total of 45 students were used as sample for the study. The symbolization of the process for conducting the experiment is shown as follows:

Group	Pre-test	Experiment	Post-test
Experiment (E)	O ₁	JIGSAW X ₁	O ₂
	O ₁	LECTURE	O ₂
		Method X ₂	

Symbols

E = Experimental Group
 C₁ = Control Group
 O₁ = Pre-test for experimental and control group
 O₂ = Post-test for experimental and control group

X₁ = Experimental Treatment (JIGSAW)
 X₂ = Control Treatment (Lecture Method)

The area of the study was library and information science departments in Colleges of Education in Anambra State. Anambra State is one of the States in the South East geographical zone of Nigeria with a total of twenty-one local government areas and six educational zones. The two selected universities in Anambra State are Anambra State University, Igbariam (Government) and Nnamdi Azikiwe University Awka (Government). Two instruments were used. One (Cataloguing and classification Achievement Test) and two Cataloguing and classification Retention Test) for data collection. The instrument was validated by two experts from Library and Information Science Their comments and suggestions were used in restructuring the test items that appeared in the final draft of the instrument. Kuder-Richardson's formula 20 (KR-20) was used to establish the reliability of the instrument. The reliability coefficient of CAT was found to be 0.86.

Experimental Procedure

The Cataloguing and classification Achievement Test was administered on the students in both the experimental and control groups before the treatment started on the first week (therefrom the pre-test result were obtained). The control group was taught with lecture method while the

experimental group was taught with jigsaw method. All teachings were done in six weeks for both groups. After the teaching the same instrument was administered to the same students (control group and experimental group) as post-test and therefrom the post-test results were obtained. After the administration of the instrument which lasted for Forty-five minutes the scores were recorded after marking and subjected to analysis.

Method of Data Analysis

The data obtained from each group using Cataloguing and classification Achievement Test was analysed using Mean and Standard Deviation. Mean and standard deviation were used to provide answers to the research questions while hypotheses were tested using Analysis of Covariance (ANCOVA) at 0.05 level of significance.

Results

Research Question 1: What would be the mean achievement scores of students taught with Jigsaw method and those taught with lecture method?

Table 1: Mean achievement scores of students taught with Jigsaw method and those taught with lecture method

S/n	GROUP/ Method	N	Pre-test		Post-test		Mean Difference
			Mean	S. D	Mean	S. D.	
1	Experimental	33	30.15	15.79	60.76	13.93	30.61
2	Control	12	16.67	6.51	35.00	12.06	18.33
	Total	45	26.56	15.10	53.89	17.61	

The summary of the mean pre-test and post test scores of students taught with Jigsaw method and those taught with lecture method presented in Table 1 shows that students in the experimental group who were taught with jigsaw method had a mean pre-test and mean post-test scores of 30.15 and 60.76 respectively with standard deviation of 15.79 and

13.93. The corresponding figures for students in the control group who were taught with lecture method are 16.67 and 35.00 respectively with standard deviation of 6.51 and 12.06. It could be observed that students who were taught with jigsaw method had a higher mean gain of 30.61 as against 18.33 obtained by those who were taught with

lecture method. This result suggests that teaching with jigsaw method enhances students' academic achievement in Cataloguing and Classification than using lecture method.

Research Question 2: What is the effect of gender on the mean achievement scores of students exposed to Jigsaw method?

Table 2: Mean achievement scores of male and female students taught with Jigsaw method

S/n	Gender	N	Pre-test		Post-test		Mean Difference
			Mean	S. D	Mean	S. D.	
1	Female	31	30.48	16.0	60.48	13.38	30.00
2	Male	2	25.00	14.14	65.00	28.284	40.00
	Total	33	30.15	15.79	60.76	13.93	

The summary of the mean pre-test and post test scores of male and female students taught with jigsaw method shows that female students obtained a mean pre-test and mean post-test scores of 30.48 and 60.48 respectively while the corresponding figures for male students are 25.00 and 65.00 respectively. It could be observed that male students who were taught with jigsaw had a higher mean gain of 40.00 as against 30.00 obtained by female students. This result

suggests that teaching with jigsaw method enhances male students' academic achievement in Cataloguing and Classification than female students.

Hypothesis 1 (HO₁): The mean achievement scores of students exposed to Jigsaw teaching method would not significantly differ from their counterparts not exposed to Jigsaw teaching method.

Table 3: Analysis of Covariance of the mean achievement scores of students taught with jigsaw and lecture methods

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Decision
Corrected Model	5838.38(a)	1	5838.38	32.16	0.00	S
Intercept	80691.72	1	80691.72	444.49	0.00	
GROUP	5838.38	1	5838.38	32.16	0.00	
Error	7806.06	43	181.54			
Total	144325.00	45				
Corrected Total	13644.44	44				

*S= Significant at 0.05 level of significance

Table 3: shows the result of the Analysis of Covariance conducted to test for significant difference in the mean post-test scores of students taught with jigsaw and lecture methods with pre-test used as covariates. The students were divided into two groups by teaching methods namely jigsaw and lecture methods. The f- value for teaching method or group is 32.16 with p- value (level of significance) being 0.00. Since the p- value is less than the stipulated probability level of 0.05, it implies that the value of f is significant at 0.05 level of significance. On this basis, the null hypothesis is rejected implying that there is significant difference in the mean achievement scores of students taught with jigsaw and lecture methods. The difference is in favour of those in the experimental group who obtained a higher mean achievement score than their counterparts as shown in Table 1.

Discussion

The finding of this study revealed that the students taught with jigsaw method had a higher mean gain than those

taught with lecture method. This is due to the fact that the jigsaw teaching method enhanced the academic achievement of the students in cataloguing and classification course. The students were able to discuss among themselves and controlled their own learning (Achufusi and Okonkwo,2017). The finding is in line with the findings of Nwankwo, and Okigbo, (2021) who in their studies found that jigsaw teaching strategy(JTS) significantly enhanced achievement and retention scores of SS2 students in chemistry more than the conventional teaching method. ANCOVA test shows that there is significance difference in the mean achievement scores of students taught with jigsaw teaching method and lecture method.

Results from Table 2 showed that male students taught with jigsaw method had a higher mean gain than their female counterparts. This is in disagreement with Yakubu (2016) who showed in his study that there was no significant difference between the mean score of the male and females when taught by using jigsaw 11 co-operative learning strategy.

Conclusion

This study revealed that jigsaw instructional strategy enhanced students' academic achievement in cataloguing and classification course than lecture method. Male students also performed better than their female counterparts in cataloguing and classification course. It can therefore be concluded that there is need for improvement in female education and that females could be encouraged to participate actively in cataloguing and classification course if cataloguing and classification lecturers, tertiary institutions management, heads of departments, authors and textbook writers, curriculum developers/planners, collaborate in unison towards this end.

Recommendation

1. Lecturers should be encouraged to employ jigsaw teaching method in teaching tertiary student, since the method has been found to enhance students' achievement in cataloguing and classification course.
2. Lecturers should be educated through attending seminars, workshops and in-service training on the use of jigsaw teaching method so that they will put these in use in their classroom teachings.
3. Government and university authority should organize training courses for the LIS lecturers on the effective and proper use of the jigsaw method on teaching library and information science concepts.
4. LIS educators and institutions should also encourage the use of jigsaw in the course of training lecturers to enable them to use it adequately.
5. Students should be encouraged to be learning in groups as provided by jigsaw learning as these will enhance academic achievement of students and also improve their understanding of the concepts.

References

- Adamu, I.A. (2018). Assesment of cataloguing and classification course in two library and information science schools in North-east, Nigeria. *African Journal of Social Science and Humanities Research* 1(1), 107-123, www.abjournals.org
- Achufusi, N.N & Okonkwo, E.O. (2017). Effect of analogy and cooperative combined instructional strategy on the achievement of senior secondary school physics students in Awka education zone. *UNIZIK Journal of STM Education*, 2(1), 66-75.
- AdLit, (2022). Classroom Strategies: Jigsaw. [http://www. Adlit.org](http://www.Adlit.org)
- Etubi, M.& Jimoh, R.F. (2017). Cataloguing and classification: A study of knowledge acquired and challenges encountered by students on industrial training at the university of Jos library, Nigeria. *Ebonyi Journal of Library and Information Science*, 4(1), 44-52.
- Firestone, M. (2021). Jigsaw activities: Examples of classroom applications. <http://www. Study.com>
- Gragg, M. (2021). What is student retention? -definition & effects. [Study.com](http://www. Study.com)
- Hance, M. (2016). The jigsaw method teaching strategy. <http://www.teachhub.com>
- Ibeneme, O.T., & Emeasoba, N.C. (2017). Effect of cooperative teaching method on academic achievement of male and female office technology and management students in business communications in polytechnics. *NAU Journal of Technology & Vocational Education*,2(1), 29-41.
- Iwhiwhu, B.E. (2022). Cataloguing and classification education and the use of library catalogue by library and information science undergraduates at Delta State University, Abraka, *Journal of Applied Information Science and Technology*, 13(2), 196-207, <http://www. Researchgate.net>
- Micheal, M.A., Yakubu, A., Abudulalli, L (2022). Effects of jigsaw cooperative learning strategies on student' interest and performance in social studies in Taraba State, Nigeria. *Global Journal of Education, Humanities and Management Sciences (GOJEHMS)*, 4(1), 66-79.
- Nabizadeh, S, Hajian, S., Sheikhan, Z. et al. (2019). Prediction of academic based on learning strategies and outcome expectations among medical students. *BMC Med Educ*19,99. <https://doi.org/10.1186/s12909-019-1527-9>
- Nwosu, O & Ndanwu, A.I. (2020). Effect of computer aided instruction (CAI) on students' academic achievement in electronic libraries in Nigerian tertiary institution. *Journal of Applied Information Science and Technology*,13(1),296-306
- Nwankwo, and Okigbo (2021). Effect of jigsaw teaching strategy on academic achievement and retention of Anambra State secondary school students in chemistry, *Unizik Journal of Educational Research and Policy Studies*,7, <http://siifactor.com/passport.php?id=21363>
- Nupur (n.d). What are the demerits of lecture method of teaching? [https://www. Preserve articles .com](https://www.Preservearticles.com)
- Nwanze, A.C. (2016). Effect of multimedia synchronized instructional strategy on student's achievement and retention in secondary school chemistry in onitsha education zone. *Unpublished Thesis, Department of Science Education, Faculty of Education, Nnamdi Azikiwe University, Awka*
- Ojekwu, I.O, & Ogunleye, B.O. (2020). Effects of jigsaw learning strategy on science students' performance and interest in biology in selected schools in Rivers state, Nigeria. *Sapientia Foundation Journal of Education, Sciences & Gender Studies*, 2(3). www.sfjsgs.com
- Okeke, A.M. (2015). Effect of jigsaw instructional strategy on students' achievement and interest in quadratic equation in Nsukka education zone. An Unpublished Thesis submitted, Department of Science Education, Faculty of Education, University of Nigeria, Nsukka.
- Quadri, R.F. & Olaleye, S. A. (2017). Attitude of students on industrial work experience scheme towards cataloguing and classification in federal polytechnic library, Offa, Kwara State, Nigeria, *Ebonyi Journal of Library and Information Science*, 4(1), 180-192.
- Simiku, H.N & Oru, P.O. (2016). Effects of dialogic method of teaching on student's achievement in marketing in colleges of education in Delta State, Nigeria. *Nigerian Journal of Business Education*,3(1), 150-161.
- Yakubu, L. (2016). Impacts of jigsaw 11 co-operative learning strategy on academic performance and retention in mensuration among senior secondary school students in Kano State, Nigeria. *Unpublished Dissertation, Department of Science Education, Faculty of Education, Ahmadu Bello, University, Zaria.*