Global Scientific JOURNALS

GSJ: Volume 9, Issue 3, March 2021, Online: ISSN 2320-9186
www.globalscientificjournal.com

# IMPACTS OF JIGSAW IV COOPERATIVE LEARNING STRATEGY (J4CLS) ON STUDENTS' PERCEPTION IN ORGANIC CHEMISTRY IN SENIOR SECONDARY SCHOOLS IN ZARIA EDUCATION ZONE, KADUNA, NIGERIA.

**BY**

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**ABSTRACT**

This study examined the impacts of Jigsaw IV Cooperative Learning Strategy (J4CLS) on Students' Perception in Organic Chemistry in Zaria Education Zone. Two research questions and two null hypotheses were formulated to guide the study. A pretest and posttest Quasi-experimental research design was used. The population consists of 1,154 Senior Secondary school Science students from eleven public co-educational schools out of which two schools were randomly selected and assigned as an experimental and control group. A sample size of 234 students was used for the study. A Validated instrument of Organic Chemistry Perception Questionnaire (OCPQ), with a reliability coefficient of 0.76 was used to generate data after treatment. The data were analyzed using Kruscal Walli's H statistics and Wilcoxcon U statistics. The results showed that the experimental group taught Organic Chemistry concepts using Jig-saw(IV) Cooperative Learning Strategy had positive perception of Organic concepts than their counterparts taught the same concepts using lecture method. However, students' gender had no impact on their perception of organic chemistry concepts. Based on the findings, it was recommended among others that Chemistry Teachers should employ the J4CLS in the teaching of Organic Chemistry in senior secondary schools' classrooms to enhance students' enthusiasm of students and positive perception about organic concepts since the strategy is student-centered based.

**Key words:** *Jigsaw IV Cooperative Learning Strategy, Perception, Organic Chemistry*

**Introduction**

According to Uchegbu, Ahuchaogu, and Amanze (2017) Education as a social-economic engineer for national development can only be achieved through an effective/workable curriculum implementation. The National Policy on Education (NPE, 2013) perceived education to be an instrument for sound change and effective development for the individual and the nation as a whole. Curriculum is defined as the planned and guided learning experiences and intended learning outcomes, formulated through the systematic reconstruction of knowledge and experience under auspices of the school for the learner's continues and willful growth in personal social competence and perception of concepts (Uchegbu, Ahuchaogu, *etal*, 2017).

Students' perception about particular concepts is one of the mental processes or skills human beings engage in. It is a cognitive activity in learning which is seen as the process of making sense out of something (Agogo, Ogbeba&Damkor-Ikpa, 2013). According to Idris, (2011), perception is that which affects and responds to each other. It considers how attitudes are shaped by parents and peers, how people perceive, evaluate others and how human beings influence each other as they interacts. Thus, perception is a process through which man continues to interact with environment, thereby, experiencing a form of strong base of knowledge that built up an individual. Students' perception about a concept can be positive or negative towards the teaching of science (Shafiu, 2014). Studies have shown that when several individuals confront an object or thing in their environment, or concepts in their subject area, the input of information that impinges on their respective sense organs, (eyes, and ears and so on) is the same for every individual, though they perceive differently (Shafiu, 2014).

On the other hand, Ortese, Yaweh and Akume (2006) posited that learners' perception is often affected by a number of factors, such as interest, lack of effective teaching strategy,

motivation, attention, self concept as well as thinking and creativity. Several studies such as that of Samba and Eriba (2012); Agogo and Ada (2014); Isa, (2018) revealed that science students perceive organic chemistry to be abstract and difficult to learn, as such they perform relatively low in Organic concept. Charania, Kausar, and Cassum in Isa, (2018), likewise investigated student perceptions of learning in a Jigsaw method-based class, and report that when students discussed their specific topic within their expert group; they increased in conceptual understanding, developed self- confidence, and enhanced communication skills and positive perception regarding the topic and the subject at large.

Originally, the term organic chemistry referred to the study of chemical compounds present in living matters, but now it is defined in terms of the study of carbon compounds, which exclude simple ones such as oxides of carbon, carbonates, cyanides and cyanates. There are vast numbers of synthetic and natural organic compounds due to the uniqueness of carbon. There have been a large number of studies that explore teaching/ learning of difficult topics at different levels of education system and which show many mismatches between scientifically accepted concepts. Students start their study with a set of beliefs above the nature of learning and what they intend to achieve (Uchegbu, Ahuchaogu, *etal*, 2017).

These beliefs are derived from early school and learning experience as well as their current goals and motive. Most secondary schools, students perform poorly in organic chemistry. According to WAEC, (2016) the chief examiners reports for chemistry have branded organic chemistry part of the questions as unpopular to the students and that very few candidates answer questions in that area. This is why Agogo and Ada (2014) observed that what may appear difficult to somebody may be easy to another person because the concepts of easiness or difficulty as perceived by somebody are dynamic. Whatever is the case, concept difficulty invariably affects students' performance in such a subject. Therefore, when desired intervention

is not given in terms of effective teaching and learning strategies chemistry students will continue to have negative perception that organic chemistry is a difficult and abstract concept. In view of this, Since the JigsawIV Cooperative Learning Strategy, allowed students to construct their own knowledge, analyze such knowledge and apply it to a real life situation (Gumel,2015). Perhaps this may enhance students' positive perception about Organic Chemistry concepts. This study therefore, investigated the student's perception of Organic Chemistry concepts using Jigsaw IV Cooperative Learning Strategy in Senior Secondary Schools in Zaria Educational Zone, Kaduna, Nigeria.

**Statement of the Problem**

The world is searching for a better way in which science can be taught in a meaningful way through activity- based Strategy. This Activity–Based Strategy can only be achieved where there are available science facilities to enhance teaching and learning of science. In developing countries, Nigeria inclusive most of the facilities are not readily available and also frequent used of inappropriate teaching strategies in Nigerian Senior Secondary Schools, lead to consistent poor performance and negative perception in all science subjects and chemistry in particular (Shafiu, 2014 & Uchegbu, Ahuchaogu, *etal*, 2017). This was further proved from the analysis made by West Africa Examination Council (WAEC, 2016), that the performance of students in chemistry from 2006 to 2016 keeps on fluctuating and this can be shown in the Table 1.1

**Table 1.1 the Performance of Students in chemistry from 2005-2015 in Kaduna State.**

| Year | Number of candidate that sat for WAEC | Number of students (pass) | Number of students (fail) | % of students (pass) | % of students (fail) |
|---|---|---|---|---|---|
| 2006 | 182659 | 39125 | 143534 | 21 | 79 |
| 2007 | 228953 | 80355 | 148598 | 35 | 65 |
| 2008 | 250099 | 85150 | 163949 | 34 | 66 |
| 2009 | 289520 | 84520 | 205000 | 29 | 71 |
| 2010 | 326541 | 98215 | 228326 | 30 | 60 |
| 2011 | 367562 | 120560 | 247002 | 33 | 67 |
| 2012 | 428034 | 80233 | 347801 | 19 | 81 |
| 2013 | 659132 | 204330 | 454802 | 31 | 69 |
| 2014 | 866616 | 251319 | 615297 | 29 | 71 |
| 2015 | 791227 | 245280 | 545947 | 31 | 69 |
| 2016 | 758849 | 295951 | 462898 | 39 | 61 |

**Source: WAEC Office Kaduna,Kaduna State, (2016)**



Statistics in Table 1.1 above indicate that the average percentage of students' pass scores is below 34% and the failure rate of 67%**.** This implies that, performance of student in Chemistry will continue to decline if the right and desired intervention is not given in terms of effective teaching and learning strategies that would enhance academic performance and positive perceptions about science concept. Several attempts have been made to investigate the effectiveness of teaching methods on academic performance in science education and findings revealed that innovative methods such as Guided Discovery, Inquiry, Science Process Approach Problem Solving Learning Strategy, Laboratory, and Cooperative teaching methods were more effective in enhancing students cognitive performance in science at SS level, (Obeka, 2010; Ibrahim, 2015; Muhammad, 2017, Isa, 2018). Yet the performance of students in science (chemistry) keeps on declining. In view of this study investigate the impact of JigsawIV

Cooperative learning strategy on students' perception of organic concepts among senior Secondary Schools in Zaria Education zone Kaduna State, Nigeria.

**Objectives of the Study**

The objectives of the study are to:

i. Examine the perception change of students in Organic Chemistry concepts after exposure to J4CLS and conventional method of teaching among SS II Students in Zaria, Kaduna State.

ii. Find out if gender difference influences students perception of organic Chemistry concepts after exposure to J4CLS

**1.4 Research Questions**

The study addressed the following research questions.

i. What is the Perception change of Students in Organic Chemistry concepts after exposure to J4CLS and Conventional Method of Teaching among SS II Students in Zaria, Kaduna State?

ii. How does gender difference influences students' perception of organic Chemistry concepts after exposure to J4CLS

**1.5 Null hypotheses**

The following null hypotheses were formulated and tested at $P \leq 0.05$ level of significance.

**$H0_1$:** There is no significant difference in students' perception of organic chemistry Concepts before and after exposure to J4CLS and those taught using Conventional Method of Teaching among SS II Students in Zaria, Kaduna State

**$H0_2$:** Gender has no significant influences students' perception of organic Chemistry concepts after exposure to J4CLS

## Methodology

### Research Design

The study employed a quasi-experimental-pretest and posttest control group design. The study involves control and experimental groups consisting of both male and female study subjects. A pre-test was administered to the groups, before the treatment, to determine the group equivalence in perceptional change. The experimental group was taught Organic Chemistry concept using J4CLS for a period of six weeks, while the control group was taught the same concept using lecture method for a period six weeks. At the end of the treatment period, a posttest was administered to both groups of students in order to determine the effectiveness of the treatment in perceptional change.

### Population of the Study

The population of this study comprised of all public co-educational Senior Secondary Schools (SS II) Students offering Chemistry as a subject in Zaria Education zone. The public coeducational schools are selected for use in this study because of their convenience, availability of infrastructure, population, readiness to assist the researcher when conducting research, gender equality among others. There are eleven senior secondary schools with a total of 1,154 students. 711 students are males and 443 students are females as presented in the table below;

**Table 2 Population of the study**

| S/No. | Name of School | Location | SSII Enrolment | | Total |
|---|---|---|---|---|---|
| | | | No of Male | No of Female | |
| 1 | Govt. Senior Sec SchMuchia | SabonGari | 75 | 60 | 135 |
| 2 | Govt. Sec. Sch. Aminu | SabonGari | 70 | 43 | 113 |
| 3 | GSS Magajia | Zaria | 74 | 36 | 110 |
| 4 | GSS Chindith Barak | SabonGari | 108 | 100 | 208 |

| | | | | | |
|---|---|---|---|---|---|
| 5 | GSS T/ Jukun | Zaria | 64 | 39 | 103 |
| 6 | GSS Gyalesu | Zaria | 48 | 29 | 77 |
| 7 | GSS Kofar KuyanBana | Zaria | 56 | 32 | 88 |
| 8 | SIASSS Karau-Karau | Zaria | 42 | 21 | 63 |
| 9 | GSS Dakace | SabonGari | 87 | 35 | 122 |
| 10 | GSS Likoro | SabonGari | 57 | 25 | 82 |
| 11 | GSS Karaukarau B | Zaria | 30 | 23 | 53 |
| | **Total** | | **711** | **443** | **1,154** |

**Source: Zonal Inspectorate Division Zaria (2016)**

**Sample and Sampling Techniques**

The samples schools were selected using simple random sampling technique. 234 students (110 in experimental group and124 in control group) from the two schools are considered as sample size for the study and this is in line with the recommendation of Tuckman (1975); Frankel and Wallen (2000) and Sambo, (2008) that sample size of minimum of 30 students is viable for experimental study of this nature.

**Table 3. Sample of the Study**

| S/No. | Name of School | Male | Female | Total | Group |
|---|---|---|---|---|---|
| 1 | School A | 73 | 37 | 110 | Experimental |
| 2 | School B | 72 | 52 | 124 | Control |
| | **Total** | **145** | **89** | **234** | |

**Instrumentation**

The instrument of this study is Organic Chemistry Perception Questionnaire (OCPQ) consist of 17 items and was divided into two sections (i.e A and B). Section A consists of items on Bio Data, while section B is made up of questions on students' perception in organic

concepts. The OCPQ was designed based on Likert 5-point scale of Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D), and Strongly Disagree (SD) with their corresponding point of 5, 4, 3, 2 and 1 respectively.

**Validity of the Instrument**

Content and face validity of OCPQ were established by three Senior Lecturers with Ph.D qualification and above in the Department of Science Education, Ahmadu Bello University, Zaria and one senior lecturer with Ph.D qualification at the department of Chemistry, faculty of Physical Sciences, Ahmadu Bello University Zaria, to judge the relevance, correctness, suitability, clarity, readability, unambiguity and completeness and so on, of the items in consideration of the research objectives and null hypotheses as well as the respondents.

**Reliability of the Instrument**

The purpose of reliability is to ascertain the feasibility and reliability co-efficient of the instruments used. In this study, the instrument was trial tested on fifty (50) students selected from GSS Jama'a Senior Secondary school of Giwa Local Government Area, Kaduna State Nigeria. The reliability coefficient of the instrument OCPQ was computed by subjecting the scores collected to Cronbach Alpha coefficient, using statiscal Package for Social Sciences (SPSS) and the value was r= 0.76. This value suggests that the test questions were reliable and as such would test what it is designed to test.



**Results and Findings**

The research hypotheses tested using the Kruscal Walli's H test and Wilcoxcon U test at P≤ 0.05. The analysis was done by the aid of Statistical Packages for Social Sciences (SPSS version 20).

**$Ho_1$:** There is no significant difference in students' perception of organic chemistry

Concepts before and after exposure to J4CLS and those taught using Conventional Method of Teaching among SS II Students in Zaria, Kaduna State

The data was analyzed using the Kruscal Walli's statistics. The results of this hypothesis is as shown in Table 4

**Table 4: Comparison of Mean Rank Perception Scores of students in Experimental and Control Groups Using Kruscal Walli's Statistics**

| Variable | Group | N | Mean Rank | Sum of Mean Rank | *df* | Sig. | Remark |
|---|---|---|---|---|---|---|---|
| Pretest | Experimental | 110 | 119.88 | 235.27 | 1 | 0.611 | *NS |
| | Control | 124 | 115.39 | | | | |
| Posttest | Experimental | 110 | 161.70 | 239.99 | 1 | 0.001 | *S |
| | Control | 124 | 78.29 | | | | |
| | Total | 234 | | | | | |

Where *S = Significant at P≤0.05, *NS= Not significant

From Table 4, the main effect of treatment group (J4CLS) on perception of students in organic chemistry concepts produced P value of 0.001. This result was significant at the 0.05 alpha levels. This indicates that there was significant difference in the perception of Chemistry students taught using J4CLS and CMT. The hypothesis two which states that "there is no significant difference in students' perception of organic chemistry before and after exposure to J4CLS and those taught using Conventional Method of Teaching" is therefore rejected. This indicates that students' perception towards Organic Chemistry concepts before the treatment (pretest) differ significantly from perception after the treatment (posttest) when exposed to J4CLS. This therefore means that when students are exposed to J4CLS, they developed positive perception which in turns enhances their Academic performance.

**$H0_2$:** Gender has no significant influences on students' perception of organic Chemistry concepts after exposure to J4CLS.

The data was analyzed using Mann—Whitney Test statistics as shown in table 5 below.

**Table 5: Comparison of Mean Rank Perception Scores of Male and Female students in Organic Chemistry using Mann—Whitney Test Statistics after exposure to J4CLS**

| **Sex** | **N** | **Mean Rank** | **Sum of Mean Rank** | ***df*** | **P-value** | **Remark** |
|---|---|---|---|---|---|---|
| Male | 73 | 56.21 | 4103.00 | 108 | 0.742 | *NS |
| Female | 37 | 54.11 | 2002.00 | | | |
| **Total** | 110 | | | | | |

From Table 5 showed that there is gender has no significant difference in the perceptional scores of male and female chemistry students taught Organic Chemistry concepts using J4CLS. This is simply because the P-value is 0.742 which is greater than P≤ 0.05 alpha values. Therefore, the null hypothesis which states that there is no significant difference in the mean achievement scores of male and female students taught Organic Chemistry concepts using J4CLS is hereby retained.

**Discussions**

The results of the analyses related to the hypothesis one (**$H_{01}$**) indicated that a significant difference exists in the perception of students in organic chemistry concepts between Senior Secondary School students taught using the J4CLS and their counterparts exposed to Conventional Method of Teaching.The significance difference in perception scores of students was in favour of the experimental group. This was due to the fact that students in Jigsaw IV group are allowed to discuss their specific topic within their expert group; reconvened to their home group and explained to the other members of the group. The consistency of students in the home groups to explain their task increased their conceptual understanding, developed self- confidence, and enhanced communication skills and positive perception regarding the topic and the subject at large.The findings of hypothesis one agree with the earlier findings of Charania, *etal* (2001)and Jansoon, Samsook and Coll (2008), Shafiu, (2014), Isa, (2018) which revealed that innovative teaching strategy particularly Jigsawcooperative learning setting increased students' positive perception towards learning.

The results of the analyses related to the hypothesis two **($H_{02}$)** indicated no significant gender differences in the perception of male and female students taught organic chemistry

concepts using J4CLS. J4CLS does not differentiate the perceptions and academic performance of both male and female students about organic chemistry concepts. The gender equality among students in Organic Chemistry concepts in Zaria Education zone was due to the fact that J4CLS allows both male and female students within the home group to actually discuss their task to other members and take on individual quiz at the end of the task. Therefore, promotes their understanding of the concept, enhances their performance and bridged the gap between negative perception male and female students. The study agrees with earlier finding of Jansoon, Samsook and Coll (2008); Uchegbu, Ahuchaogu, and Amanze (2017) and Isa, (2018).

**Conclusion**

From the findings in this study, the following conclusions are drawn that J4CLS has potentiality for enhances higher order thinking skills, promotes positive students' perception in Organic Chemistry concepts and gender friendly among students exposed to J4CLS. Therefore Jigsaw IV Cooperating Learning model is viable and has potential of enhancing senior secondary school chemistry students' perception in science subjects particularly Chemistry. This is therefore observed that the lecture method (conventional method of instruction) commonly used by teachers in secondary schools is not quite suitable for meaningful teaching and learning of science concept as it is not a student centered approach.

**Recommendations**

1. The State government, institutions and professional bodies such as National Teachers Institution (NTI), Science Teachers Association of Nigeria (STAN), Teachers' Registration Council of Nigeria (TRCN) and National Education Research Department Council (NERDC) should organize seminars, workshops, in-service and re-training programme for teachers on the effective use of Activity- based, students centered teaching strategy that focus on constructivist learning in the teaching of chemistry.
2. It was found in this study that, gender does not play a significant role in the learning and perception of students in organic chemistry concept using J4CLS. A common curriculum

for male and female students and a common instructional strategy may be found adequate for secondary school Chemistry students, at least at secondary school level on which this study focuses.

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