

## EFFECTS OF JIGSAW INSTRUCTIONAL STRATEGY AND DISCUSSION METHOD ON STUDENTS' ATTITUDE TOWARDS BASIC SCIENCE IN EKITI STATE, NIGERIA

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### Abstract

The study examined the effects of jigsaw instructional strategy and discussion method on students' attitude towards Basic Science in Ekiti State, Nigeria. It also determined the effects of gender on students' attitudes. The study adopted a quasi-experimental pre-test, post-test, control group design. The sample for the study comprised 172 selected Junior Secondary School Two (JSS II) students from the three Senatorial Districts in Ekiti State using multistage sampling procedures. Intact classes were used in each of the three schools selected for the study. The instruments used for the study were Basic Science Performance Test (BSPT) and Questionnaire on Attitude of Students towards Basic Science (QASBS). The reliability of each instrument was determined using split-half method. Reliability coefficients of 0.73 and 0.78 were obtained for BSPT and QASBS respectively. The experiment was carried out in three stages; the pre-treatment stage, the treatment stage and post-treatment stage. One general question and three hypotheses were raised. Data collected were analyzed using the descriptive and inferential analyses. The research question was answered using mean, standard deviation and bar-charts. All hypotheses generated were tested using inferential statistics of Analysis of Variance (ANOVA), t-test, Analysis of Covariance (ANCOVA). Post-hoc analyses were done where necessary using Multiple Classification Analysis (MCA) and Scheffe's test. All hypotheses were tested at 0.05 level of significance. The results from the study revealed that both experimental strategies had positive effects on students' attitude towards Basic Science. The findings also revealed that both experimental instructional strategies were not gender sensitive. Based on the findings of this study, it was therefore recommended that, the conventional method commonly used in teaching Basic Sciences should be modified and improved upon by making lessons activity based.

**Keywords:** Jigsaw, Discussion method, Instructional Strategy, Attitude, Basic Science

### Introduction

Science and technology play vital roles in the lives of individuals and in the development of a nation. It is

widely and generally acknowledged that the gateway to the survival of any nation socially and economically is through scientific and technological literacy which can only be achieved through science (Mokyr, Vickers, and Ziebarth, 2015). Basic Science is a science subject taught at the lower and upper primary basic junior secondary school levels.

Basic Science, formerly known as Integrated Science, is the first knowledge of science which a child encounters at the junior secondary school level. Hence, Basic Science curriculum prepares students at the; Junior Secondary School level for the study of core science and technical subjects at the senior secondary school level (Gresnigt, Taconis, Gravemeijer, and Baartman, 2014). This implies that for a student to be able to study science and technical subjects at the senior secondary school level successfully, he/she has to be well grounded in basic science at the junior secondary school level. In view of this, Basic Science is being given greater emphasis at the junior secondary schools in Nigeria. In a bid to promote science education, the Federal Government of Nigeria in the National Policy on Education (NPE) came up with 6-3-3-4 policy on education which stipulates that a child should spend six years at the primary school level, three years at the Junior Secondary School level, three years at the Senior Secondary School level, and four years in the University.

Dike (2014) remarked that it is not enough to produce curriculum, it is even more important to put in place machinery that will ensure that its ideals are realizable through effective classroom practices. Foremost among the myriad of challenges of Basic Education in Nigeria are the issues of teachers' quality and development, lack of enough specialist teachers, lack of relevant support materials for teachers and inadequate supervision and mentoring of teachers. Teaching includes provision of conditions that can promote the building of attitudes, skills development and other aspects of learning. Unless learning takes place as a result of some efforts, we cannot conclude that teaching has taken place. In the teaching - learning process, both the teacher and the learner must be active.

In the past, a student's success was based on the amount of information they could memorize, however in today's information age, conceptual knowledge is more important. Facts can simply be obtained from the internet while the understanding of concepts is the basis for students' success, mostly in the classroom and the real world. The concepts are mostly acquired through teaching which includes provision of conditions that can promote the building of attitudes, skills development and other aspects of learning. Unless learning takes place as a result of some efforts, we cannot conclude that teaching has taken place (Michael, 2013). The teachers' role in a Student-centered learning environment may be a facilitator or a guider. The students are in control of their own learning and the power and responsibility are the students' concern Michael (2013) opined that the problem with respect to teaching approach is that most teachers still believe that the most effective means of communicating knowledge is via the conventional "talk and chalk" approach. The "talk and chalk" as used in this context is the traditional way of imparting knowledge whereby students' participation is limited during teaching process. The teacher-centered approach of teaching and also refer to as conventional teaching approach has not been able to meet learners' needs as mass failure of students in sciences is a reoccurring issue. The conventional teaching approach most often is found to favour the educationally advantaged children (gifted, high ability students) at the detriment of the educationally disadvantaged students. This approach might not be successful in promoting students' interest in learning sciences which may adversely affect their performances. Thus, there is the need to find out other teaching strategies that may make learning of Basic Science more meaningful and interesting so as to improve students' attitude in the subject. The choice of methods to be used depends on some factors such as; the concept to be taught, the targeted audience, available instructional materials and learning objectives to be achieved. In situations where appropriate learning strategies are used, it may arouse students' interest and attitude towards the subject.

Researches has shown that many instructors were taught with the traditional approach and flourished with this method and so many teachers use verbal explanation throughout the lesson and render the student's passive without contributing to the lesson in any form. All they do is to memorize the teacher's note for the purpose of passing examinations. As a result, they may not be able to benefit maximally from the lesson and the little knowledge gained is likely to be forgotten after the examinations. It is on this basis that some active strategies are developed, especially those that have to do with cooperative learning.

Jigsaw classroom strategy is a research-based cooperative learning technique invented and developed in the early 1970s by Elliot Aronson and his students at the University of Texas and the University of California. Since 1971, thousands of classrooms have used Jigsaw with great success. "Jigsaw Method" is a **teaching strategy** of organizing students group work that helps students collaborate and rely on one another for effective accomplishment of multiple tasks at once and for giving students a greater sense of individual responsibility. According to Reys (2010) and Ariyana (2013), Jigsaw is a cooperative learning strategy that enables each student of a 'home' group to specialize in one aspect of a learning unit. Students meet with members from other groups who are assigned the same aspect and after mastering the material, return to the 'home group' and teach this material to the group members. Jigsaw can be used whenever material can be segmented into separate components. Each group member becomes an expert on a different concept or procedure and teaches it to the group. Just like a Jigsaw puzzle, each piece (student part) is essential for the completion and full understanding of the final product. Therefore, each student is essential for the understanding of the whole concept being taught.

According to Ariyana (2013), the advantage of Jigsaw learning strategy is that students perform the challenging and engaging tasks in their expert groups with enthusiasm since they know they are the only ones with that piece of information when they move to their respective groups. Students who tutor each other must develop a clear idea of the concept they are presenting and orally communicate it to their partner. Gillies & Haynes (2010) claimed that "placing people in the same room, seating them together, telling them that they are a cooperative group, and advising them to 'cooperate', does not make them a cooperative group". A cooperative learning environment will exist if groups are structured in such a way that group members co-ordinate activities to facilitate one another's learning. Elliot Aronson – one of the early pioneers of the jigsaw method – explains that "The Jigsaw Method" is a teaching strategy of organizing student group work that helps students collaborate and rely on one another. This teaching strategy is effective for accomplishing multiple tasks at once and for giving students a greater sense of individual responsibility. Here is the basic way this popular teaching strategy is used in classrooms:

1. students are broken down into groups.
2. each student within the group is assigned a specific role or task.
3. as the group works, students contribute their role/task to the group's overall

efforts.

With this simple approach to group work, each individual has something unique to contribute to their group's outcome. No one else in the group is doing the same task, so each student experiences a higher sense of ownership and accountability to the members of their group.

Farooq and Chaudry (2011) described discussion method as collaborative exchange of ideas between a teacher and students or among students for the purpose of furthering students thinking, learning, problem solving and understanding of concepts. They stated that discussion can be used in multiple ways when teaching; whole-class approach, small group approach and learner-centered strategy, allowing students an opportunity to take control and be responsible for their learning and it allows an opportunity for learning in an innovative, creative and interesting way for both students and teachers. Classroom discussion is sometimes practiced in secondary schools during lessons especially in science classes. These could be directed towards solving certain problems in sciences.

Joseph (2010) described this method as "middle-of-the-road teaching technique for instructors desiring to moderate levels of students' participation. Perhaps, it has been noted that if a teacher's primary purpose is to communicate specific and voluminous information to his students, the lecture method may be more appropriate. Also, if a teacher desires extensive participation by all members of the class in the lesson, it is often suggested that the class should be broken into smaller groups. Discussion implies involving the entire group in a topic under study. In this approach, both the teacher and students collaborate to meet mutually set goals (Friedland & Millen, 2011). There are also some limitations with using discussion as a teaching strategy too, such as talkative students dominating the discussion and student disengagement through not staying on task. Discussion strategy can be an excellent strategy for enhancing student motivation, fostering intellectual agility, and encouraging democratic habits. They create opportunities for students to practice and sharpen a number of skills, including the ability to articulate and defend positions, consider different points of view, enlist and evaluate evidence (Friedland & Millen, 2011). Discussions provide avenues for exploration and discovery, leading a discussion can be anxiety-producing; discussions are by their nature unpredictable, and require the instructors to surrender a certain degree of control over the flow of

information.

Gender is one of the factors that have for long been a concern to researcher to have considerable effects on students' academic performance and attitude especially in science subjects. Gender is the range of physical, biological, mental and behavioral characteristics pertaining to and differentiating between the feminine and masculine (female and male) population (Wood & Eagly, 2015). Animasaun and Abegunrin (2017) in their studies indicated that girls and boys differ in their interest in science-related topics. Students' view of science affects the quantity and quality of knowledge acquired in the classroom. Their thoughts about science are the mirror of science education, since it is this very notion that influences their attitude and the way they perceive science and of course learning outcomes in school.

Other researchers advance a maturational hypothesis as a reason for the gender differences in achievement where boys develop more slowly than girls and, therefore, lag behind in terms of literacy and other basic (Allen, Vella-Brodrick, & Waters, 2016). In terms of pedagogy, some researchers have advanced the feminization of school and curricula is inimical to the academic advancement of males (Joseph, Ramsook, & Simonette, 2016). Some researchers also recommend the need for a re-articulation of curricula to reflect boy-friendly relevance and pedagogy or a recuperative masculinity agenda (Cobbett & Younger, 2012). The majority of students felt that the thrust towards female empowerment and gender equity or the greater focus of females on academic achievement was responsible for their higher level of performance in secondary schools. It is interesting and instructive to note that students generally believe that female success over their male counterparts is related to the current societal movement that drives female motivation and the quest for gender parity. This is not unlike the viewpoint of Majzub and Rais (2010) who stated that some boys do not mug well compared to some girls who can sit and concentrate for lengthy periods of time. Past research suggested that girls are in general more successful in school than boys. Hartley and Sutton (2013) have recently reported that boys develop gender stereotypes according to which girls are perceived as academically superior with regard to motivation, ability, performance, and self-regulation. However, previous studies revealed rather inconsistent results concerning gender differences in different domains of school achievement.

Observations have shown that students' attitude to Basic science can also have great influence on their learning outcomes. Attitude are formed by people as a

result of some kinds of learning experience if the experience is favourable a positive attitude is found and vice versa (Orunaboka, 2011). The attitude people hold can frequently influence the way they act in person and larger situation. For this reason, administrators, psychologists and sociologists are concerned with attitude development, how they affect behaviour and how they can be changed. Attitude does not only include the negative attitude such as prejudices, biases and dislikes, but also positive attitudes are sometimes called sentiment, which include our attachment and loyalties to persons, objects and ideas ( Shehu, Enemali, Muhammad & Nordin, 2015). Attitude thus seems like a system of ideas with an emotional core or content. Human beings are not born with attitudes, they learn afterwards. Some attitudes are based on people's own experience, knowledge and skills and some are gained from other sources. It changes in the course of time and gradually (Olasheinde & Olatoye, 2014).

According to Oludipe (2010), what has remained the main focus of great concern in the field of science education are the biases and misconceptions about women and science. Many researches had been carried out on gender issues with mixed reports in science education. Girls are being encouraged and sensitized into developing positive attitudes towards science. Adigun (2015) attested to the fact that science teaching has not been properly done and opined that one of the basic ingredients for effective learning is the active participation of the learners and their interest. Most students find themselves in science class because their parents compelled them to offer the subjects and this made them to have nonchalant attitude towards the subject and their participation in the class work might not be encouraging and may affect their learning outcomes.

Several factors play a vital role in influencing students' attitude. These factors according to Aguilera and Perales (2019) can be categorized into three distinctive groups. Firstly, factors associated with the students themselves. Some of these factors include students' achievement score, anxiety towards the subject, students' self-efficacy, self-concept, extrinsic motivation and experiences at school. Secondly, the factors that is associated with the school, teacher and teaching strategy. Some of these factors that influence attitudes are teaching materials used by teacher, teachers' classroom management, teachers' content knowledge and personality, teaching topics with real life enriched examples, other students' opinions about courses, teaching methods, reinforcement, receiving private tuition, teachers' believe, teachers' attitude.

Thirdly, factors from the home environment and society also affect students' attitude towards a subject. Factors such as educational background of parents, occupation of parents and parental expectations play a crucial role in influencing students' attitude. Due to these several factors, students have different attitude towards Basic Science. Some studies show that students have a relatively positive attitude towards sciences (Lukhele, 2013). Hence it can be said that students' attitude towards sciences are very subjective and varies among the students

### Statement of the Problem

Student performance in Basic Science has not been encouraging and there could be many reasons attributed to this poor academic performance; shortage of qualified and experienced teachers, lack of instructional materials, teaching methodology, etc. It has also been observed by the researcher that many students, after learning about science concepts through activities that address the various intelligences and learning styles, still choose not to participate in classroom discussion, which might be as a result of boredom from inactive participation in the chalk and talk method (conventional method). Some students may even view the subjects as being difficult.

The study tends to investigate the effects of Jigsaw Instructional strategy and Discussion method on attitude of students in Basic Science in Ekiti State, Nigeria.

### Purpose of the Study

The specific objectives of the study are to:

- i. investigate the effects of jigsaw instructional strategy and discussion method on students' performance towards Basic Science;
- ii. examine the effects of jigsaw instructional strategy and discussion method on students attitude Basic Science; and
- iii. determine the effects of gender on students' attitude towards Basic Science.

### Hypotheses

In an attempt to answer the question raised in this study, the following research hypotheses were generated:

1. There is no significant effects of jigsaw instructional strategy and discussion method on students' performance towards Basic Science.
2. There is no significant effects of jigsaw instructional strategy and discussion method

on students attitude Basic Science

- There is no significant effect of post-test mean scores of male and female students in each of the experimental and control groups

**Methodology**

The study adopted a quasi-experimental pre-test, post-test, control group design. The pre-test measures the entry behaviour of the respondents while the post-test measured the level of the performance. Two groups were assigned to treatment and one control groups. The design of the study is presented as follows.

- Experimental Group I = O<sub>1</sub> X<sub>1</sub> O<sub>2</sub>
- Experimental Group II = O<sub>3</sub> X<sub>2</sub> O<sub>4</sub>
- Control Group = O<sub>5</sub> X<sub>c</sub> O<sub>6</sub>
- Where O<sub>1</sub>, O<sub>3</sub>, O<sub>5</sub> = Pre-test Observations
- O<sub>2</sub>, O<sub>4</sub>, O<sub>6</sub> = Post-test Observations
- X<sub>1</sub> = Treatment for group 1 (Jigsaw Instructional Strategy)
- X<sub>2</sub> = Treatment for group 2 (Discussion Instructional Strategy)
- X<sub>c</sub> = Treatment for control group

The population of the study consisted all the 16,256 Junior Secondary School class II Students in all 209 public Schools across the 16 Local Government Areas of Ekiti State, Nigeria. (Source: Ekiti State Ministry of

Education, 2020).

The sample for this study comprised 172 selected Junior Secondary School Two (JSSII) students from the three Senatorial Districts in Ekiti state using multistage sampling procedures. The instruments used for the study were Basic Science Performance Test and Questionnaire on Attitude of Students towards Basic Science (BSPT) and (QASBS) respectively. The reliability of the instruments was determined using split-half method. The items were administered on 20 students from two schools that were not used for the study. After two weeks, the instrument was re-administered to the same set of students. The reliability of the instruments was determined by split-half procedures which involves scoring two halves (usually odd items versus even items) of the test separately and then calculate a correlation coefficient for the two sets using reliability coefficient and the final reliability coefficient is calculated using Spearman-Brown Prediction formula to get 0.73 for BSPT and 0.78 for QASBS which is considered to be high for use. Data collected were analyzed using the descriptive and inferential analyses. The research questions were answered using mean, standard deviation and bar-charts. All hypotheses generated were tested using inferential statistics. Hypotheses 1 was tested using Analysis of Variance (ANOVA), hypotheses 2, 3 and 4 were tested using Analysis of Covariance (ANCOVA). Post-hoc analysis was done where necessary using Scheffe's test. All the hypotheses were tested at 0.05 level of

**Results**

**Hypothesis 1:**

There are no significant effects in the pre-test mean scores of students in the experimental and control groups.

In order to test the hypothesis, pre-test mean scores of the experimental and control groups were computed and compared for statistical significance at 0.05 level. The result is presented in Table 1

**Table 1: ANOVA Showing Pre-test Mean Scores of the Experimental and Control Groups**

Source	SS	Df	MS	F	P
Between Group	241.378	2	120.689	3.937	0.721
Within Group	5425.400	169	30.652		
<b>Total</b>	<b>5666.778</b>	<b>171</b>			

**p>0.05**

The result in Table 1 showed that F= 3.937, P= 0.721 > 0.05. Therefore, there was no significant difference in the pre-test mean scores of the experimental and control groups at 0.05 level of significance. Hence, the null hypothesis was not rejected.

**Hypothesis 2:**

There is no significant effects of jigsaw instructional strategy and discussion method on students' performance towards Basic Science and control group

In order to test the hypothesis, post-test mean scores of the experimental and control groups were computed and compared for statistical significance at 0.05 level. The results are presented in Table 2 and 3 as follows;

**Table 2: ANCOVA Summary of Post-test Mean Scores of Experimental and Control Groups**

Source	SS	Df	MS	F	P	Sig.
Corrected Model	998.856 <sup>a</sup>	3	332.952	13.116	.183	.000
Intercept	3835.222	1	3835.222	151.078	.462	.000
Covariate (Pre-test)	407.778	1	407.778	16.063	.084	.000
Group	665.842	2	332.921	13.115	.130	.000
Error	4467.872	168	25.386			
Total	181123.000	172				
Corrected Total	5466.728	171				

Table 2 shows that F= 13.115, P= 0.000<0.05 at 0.05 level of significance. This implies that there was a significant difference between the post-test mean scores of students in the experimental and control groups. This indicated that the groups differ significantly. Hence the null hypothesis was rejected.

In order to determine the pair of groups that are significantly different from each other, Scheffe Post-Hoc analysis was used. The result is shown in Table 3 below;

**Table 3: Scheffe Post-Hoc Analysis of Post-test Mean Scores of Experimental and Control Groups**

Groups	Mean	Jigsaw	Discussion	Control
		30.56	21.61	15.68
Jigsaw	30.56			
Discussion	21.61	*		
Control	15.68	*	*	

\* The mean difference is Significant at p<0.05

In Table 3, a significant difference was found between the performance of students exposed to jigsaw strategy and discussion strategy in favour of students exposed to jigsaw strategy. Also there was significant difference between the performance of students exposed to jigsaw strategy and control group in favour of students exposed to jigsaw strategy. Furthermore, there was significant difference between the performance of students exposed to discussion strategy and control group in favour of students exposed to discussion strategy.

was the highest followed by discussion strategy, implying that the performance of students in Basic Science exposed to conventional strategy was the least.

**Hypothesis 3:**

There is no significant difference between the post-test mean scores of male and female students in each of the experimental and control groups.

To test this hypothesis, post-test mean scores of male and female students in each of the experimental and control groups were computed and compared for statistical significance at 0.05 level. The result is presented in Table 6 as follows;

The result of post-hoc test also showed that, of all students exposed to the three strategies, the performance of students exposed to jigsaw strategy

**Table 4: Analysis of Covariance (ANCOVA) Summary of Post-test Mean Scores of Male and Female Students in Each of the Experimental and Control Groups.**

Source	SS	Df	MS	F	P
Corrected Model	406.586 <sup>a</sup>	2	203.293	7.111	0.001
Intercept	2985.926	1	2985.926	104.445	0.000
Covariate (Pre-test)	406.190	1	406.190	14.208	0.000
Group	73.572	1	73.572	2.574	0.110
Error	5060.142	169	28.588		
<b>Total</b>	<b>181123.000</b>	<b>172</b>			
<b>Corrected Total</b>	<b>5466.728</b>	<b>171</b>			

Table 4 showed that the F-value, F-cal (2.58), with a P value (0.110),  $P > 0.05$  alpha level obtained for both male and female involved in the study was not significant at 0.05 level of significance. The null hypothesis was therefore not rejected. Hence, there was no significant difference between the post-test mean scores of male and female students in each of the experimental and control groups.

**Table 5: ANCOVA Summary of the Attitudinal Mean Scores of Male and Female Students in Each of the Experimental and Control Groups**

Source	SS	Df	MS	F	P	Sig.
Corrected Model	840.577 <sup>a</sup>	2	420.289	20.087	.183	.000
Intercept	4608.686	1	4608.686	220.262	.462	.000
Covariate (Pre-test)	5.735	1	5.735	274	.084	.601
Group	805.913	1	805.913	38.517	.130	.000
Error	3703.484	168	20.924			
<b>Total</b>	<b>181123.000</b>	<b>172</b>				
<b>Corrected Total</b>	<b>4544.061</b>	<b>171</b>				

Table 5 showed that the F-value, F-cal (38.517), with a P value of (0.000) which is less than  $P < 0.05$  alpha level obtained for both male and female involved in the study was significant at 0.05 level of significance. The null hypothesis was therefore rejected. This implies that there was a significant difference between the attitudinal mean scores of male and female

**Table 6: Scheffe Post-Hoc Analysis of Attitudinal Mean Scores of Male and Female Students in Each of the Experimental and Control Groups**

Groups	Mean	Jigsaw	Discussion	Control
		29.87	20.16	14.53
Jigsaw	29.87			
Discussion	20.16	*		
Control	14.53	*	*	

\* The mean difference is Significant at  $p < 0.05$

In Table 6, a significant difference was found between the attitude of male and female students exposed to jigsaw strategy and discussion strategy in favour of students exposed to jigsaw strategy. Also, there was significant difference between the attitude of male and female students exposed to jigsaw strategy and control group in favour of students exposed to jigsaw strategy. Furthermore, there was significant difference between the attitude of male and female students exposed to discussion strategy and control group in favour of students exposed to discussion strategy.

The result of post-hoc test also showed that, of all students exposed to the three strategies, the

#### Hypothesis 4:

There is no significant effects of jigsaw instructional strategy and discussion method on students attitude Basic Science and control group

To test this hypothesis, attitudinal mean scores of the male and female students in each of the experimental and control groups were computed and compared for statistical significance at 0.05 level. The results are presented in Table 5 as follows;

students in each of the experimental and control groups.

In order to determine the pair of groups that are significantly different from each other, Scheffe Post-Hoc analysis was used. The result is shown in Table 6 below;

performance of students exposed to jigsaw strategy was the highest followed by discussion strategy, implying that the performance of students in Basic Science exposed to conventional strategy was the least.

#### Discussion of Findings

The study found out that the use of jigsaw instructional strategy and discussion method also had positive effects on students' learning outcomes in Basic Science. This finding also corroborates the submission of Karsai and Kampis (2010) that to increase students' interest and competence in the field of science, we need to develop and accept a different

approach to teaching science. This was also supported by the finding of Kpolovie (2014) who reported the significant relationship between the attitude towards science and performance in science, where the students who had positive attitudes achieved better learning outcome.

In addition, the study also revealed that there was significant difference in the attitudinal mean scores of male and female students in each of the experimental and control groups. Meaning that, the use of jigsaw and discussion instructional strategies had positive effects on the attitude and performance of students towards Basic Science. This is in agreement with the findings of Gokhale, Woebis and Machina (2014) that attitudes towards science lesson did not vary between genders. Although there were no significant differences between the attitudes toward science according to gender, they stated that male students rated science as a subject more exciting than female students in elementary and secondary schools. Females often plan a science major mainly because they needed a science background in order to enter a health profession such as medicine or physical therapy. Females generally found science uninteresting and the scientific lifestyle (as perceived by them) unattractive. The differences emerged from the study of Wood (2015) is that males are more positive in their enjoyment of science, motivation in science, and self-concept of science whereas the females are more positive in their perception of the science teacher and the value of science to society.

The study further revealed that there was no significant difference in the attitudinal mean scores of male and female students in each of the experimental groups. The study confirmed that the main effect of gender on students' attitude is not significant. The male and female students exposed to the same treatment do not differ significantly in their attitudinal mean scores. To support the above submission, Samir (2012) found out that whether the students are male or female, they have same attitude towards learning science, but little variations could be as a result of low equipped laboratory, poorly motivated teachers among others.

The findings from the analysis showed that:

1. There was no significant difference in the pre-test mean scores of the experimental and control groups
2. There was a significant difference between the post-test mean scores of students in the experimental and control groups.

3. There was no significant difference between the post-test mean scores of male and female students in each of the experimental and control groups.
4. There was a significant difference between the attitudinal mean scores of male and female students in each of the experimental and control groups.

#### Conclusion

Based on the findings of this study, it was concluded that jigsaw and discussion instructional strategy had the potency of improving the learning outcomes of students than the conventional method commonly used to teach. Gender does not play any significant role in students' learning outcomes. Therefore, jigsaw and discussion strategies are instructions that are not gender biased and enhance students' learning outcomes.

#### Recommendations

On the basis of the findings of this study, it is recommended that the conventional method commonly used in teaching Basic sciences should be modified and improved upon by making lessons activity-based.

1. The potential of jigsaw and discussion strategies should be utilized to enhance positive attitude.
2. Government should organize and sponsor teachers to attend training courses on the use of Jigsaw and Discussion instructional strategies in order to facilitate their adoption.

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