

EFFECTS OF JIGSAW METHOD ON SENIOR SECONDARY SCHOOL STUDENTS' LEARNING OUTCOMES IN AGRICULTURAL SCIENCE IN EKITI STATE, NIGERIA

BY

Prof. R. O. FAMIWOLE (MNIM)

Professor, Department of Vocational and Technical Education, Ekiti State University, Ado-Ekiti.
Remifamiwole@gmail.com

AJIBARE, ABIKE YEMISI

Faculty of Education, Department of Vocational and Technical Education, Ekiti State University, Ado-Ekiti.

Abstract

The study investigated the effects jigsaw method of teaching on senior secondary school students' learning outcomes in Agricultural science in Ekiti State. The study adopted the quasi-experimental research design of pre-test, post-test and control group. The population comprised all Senior Secondary School Two Agricultural Science students in public secondary schools in Ekiti State. The sample consisted of 160 senior secondary school II Agricultural Science students using multistage sampling procedure. The instruments used were 'Performance Test for Agricultural Science Students (PTASS)' and 'Students' Attitude towards Agricultural Science Scale (SATASS)' with reliability coefficients of 0.82 and 0.87 respectively after being subjected to test retest method. Research questions were analysed using descriptive analysis of mean and standard deviation while the hypotheses were tested using t-test at 0.05 level of significance. The findings showed that jigsaw method of teaching improved students' performance in Agricultural science. Also, the findings of this study showed that gender has no effect on students' performance and attitude towards Agricultural Science. Based on the findings of the study, it was recommended that curriculum planners should encourage the teachers for the implementation of jigsaw method of teaching Agricultural Science in Ekiti State secondary schools.

Key words: Jigsaw Method, Learning Outcomes, Agricultural Science

Introduction

Jigsaw method is an effective way to increase student engagement through group work that facilitates peer-to-peer learning. As a form of co-operative 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 grounded in social interdependence theory (Johnson & Johnson, 2009). Jigsaw method is an instructional method in which the students at various level forms a team to work together for one another's learning as well as their own benefits. This implies that there is no superiority complex in jigsaw method of teaching. The

learners work together on learning task with the goal of all participants benefiting from the interaction and personal lifestyle where individuals are responsible for their actions, including learning and respect the abilities and contribution of their peers. The purpose of jigsaw method according to Simsek (2013) is to develop team work and learning skills within all students.

In addition, it helps develop a depth of knowledge not possible if students were to try and learn all of the materials on their own. Gambari (2010) reported that individualistic and conventional classroom instructions were not effective as jigsaw learning method. Also Chiu (2008) explained that students work in groups to complete tasks collectively towards academic goal unlike individual learning which can be competitive in nature. Students learning co-operatively capitalize on one another's resources and skills (asking one another's information, evaluating one another's ideas, monitoring one another's work). It means jigsaw method is a process of acquiring new or modifying existing knowledge, behaviour, skills, values or preferences which may involve synthesizing different types of information. Agricultural Science as a pre-vocational subject at junior secondary school and vocational subject at senior secondary school level is aimed at imparting appropriate skills, values and knowledge to learners making use of result-oriented teaching method.

Teaching method is practical application of teaching principles based on the nature of the subject, learner, and various needs of the students at a particular point in time. Famiwole (2017) explained that teaching and learning process in agriculture in Nigerian schools need to be carried out to a point where students can learn by doing, acquire saleable skills and experience that can be sold to employers or with which to establish as an entrepreneur after school. It means the creation of a situation which facilitates learning or leads to learning. This implies active involvement of the students as in jigsaw learning method leads to meaningful learning. Meaningful learning takes place when the learner is able to apply the knowledge and skills acquired in solving problem. Learning becomes more effective and valued amidst a high level of interaction which is the central tenet of jigsaw method of teaching.

Jigsaw method of teaching was also described by De-Baz (2001) as the method whereby students are members of two different groups, the home groups and the expert groups with 4-6 members, to work on an instructional material that has been broken down into sections. Each student from every home group is assigned a portion of the material. Then the home groups break apart like pieces of the jigsaw puzzle, and each home team sends representatives to join with other representatives from all the other teams and form expert groups. While in the expert groups the students study intensively their particular material to ensure that they understand it well and prepare it for peer tutoring. Later, each student returns to his/her respective home group where he or she teaches his assigned material to the rest of his/her group and learns the other sub-topics from his or her peers in the group. After the completion of the assigned learning tasks over a number of class periods each student takes an individual test.

In comparison with jigsaw learning method, lecture-based teaching has been reported by Slavin (2011), to be less effective to the demands of high rates of cognitive and affective outcomes. Consequent about the relevance and value of teaching method to students' academic performance, there is need to introduce appropriate methods of teaching that do not only create co-operative pleasant atmosphere but enhance peer relations and also increase academic performance of students. Therefore, this study investigated effects of jigsaw method on Senior Secondary

School students' achievement in Agricultural Science in Ekiti State.

Statement of the problem

It has been observed in the recent years that teaching method serves as an effective tool for improving teaching and learning of Agricultural Science. It is very crucial to use appropriate teaching method because it would enhance the performance and the mastery of the subject matter by the students. To facilitate the process of knowledge transmission, teachers are expected to apply appropriate teaching method that best suit specific objectives to be achieved. The researcher observed that many teachers still cling to lecture method and this has negative effect on students' learning performance and attitude of students towards Agricultural Science. A look into the secondary school reveals the dwindling interest of students in studying Agricultural Science while the few studying the subject are no more skilled to perform major agricultural tasks which may be linked to the type of teaching method employed. It is based on this view that the researcher is interested in carrying out an investigation on the effects of Jigsaw Method on senior secondary school students' learning outcomes in Agricultural Science in Ekiti State.

Purpose of the Study

The study investigated the effects of Jigsaw Method on senior secondary school student's learning outcomes in Agricultural Science in Ekiti State, Nigeria. The study specifically:

1. determined the extent to which the application of Jigsaw Method enhanced students' performance in Agricultural Science ;
2. compared the effects of Jigsaw Method with another set of students that were taught conventionally;

Research Questions

The following research questions guided this study:

1. What are the pre-test and post-test mean scores of students in Jigsaw Method and Conventional Method in Agricultural Science in Ekiti State secondary schools?
2. What are the influence of gender on students' performance in Agricultural Science when exposed to Jigsaw Method and Conventional Method of teaching in Ekiti State secondary schools?

Research Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance:

1. There is no significant difference in academic performance scores of male and female Agricultural Science students taught with Jigsaw method of teaching.
2. There is no significant difference in the attitudinal scores of male and female students exposed to Jigsaw Method of teaching.
3. There is no significant influence of location on students' attitude towards Agricultural Science when exposed to Jigsaw method of teaching.

Methodology

The quasi-experimental design was employed in this study (pre-test, post-test, control group type). The population for this study consisted of all the Senior Secondary School II Agricultural Science students in all the public senior secondary schools in Ekiti State. The sample for this study consisted of 160 Senior Secondary School II Agricultural Science Students. Multistage

Sampling procedure was used to select the needed sample for the study.

Two instruments tagged ‘Performance Test for Agricultural Science Students (PTASS)’ and ‘Students’ Attitude towards Agricultural Science Scale (SATASS)’ were used to collect data for this study. Performance Test for Agricultural Science Students (PTASS) was used as pretest and posttest to collect data on students’ level of performance in Agricultural Science. It consisted of 50 items test format drawn from 2014-2017 West African Examination Council past questions. Students’ Attitude towards Agricultural Science Scale (SATASS) consisted of 35 items rated on a four point likert-type scale ranging from Strongly Agree (SA) = 4, Agree (A) = 3, Disagree (D) = 2, and Strongly Disagree (SD) = 1. Two lesson plan was prepared and used for the study. The face and content validity of the instruments were established by experts’ judgment. The instruments were presented to experts in Vocational and Technical Education, Science Education as well as Tests and Measurement for face and content validity. The reliability of the instruments was ascertained using the test-retest method. The scores obtained from the two tests were subjected to Pearson’s Product Moment Correlation Analysis to obtain a reliability coefficient of 0.74 and 0.76 for ‘Performance Test for Agricultural Science Students (PTASS)’ and ‘Students’ Attitude towards Agricultural Science Scale (SATASS)’ respectively.

The pretest was conducted among the students without teaching them. After the six weeks treatment, posttest was conducted for the two groups the following week.

The data collected for the study were analyzed using descriptive and inferential statistics. Descriptive statistics of mean and standard deviation were used to answer the research questions raised. Inferential statistics of t-test was used to test the two hypotheses. The hypotheses were tested at 0.05 level of significance.

Results

Descriptive Analysis

Research Question 1: What are the pre-test and post-test mean scores of students in Jigsaw Method and Conventional Method in Agricultural Science in Ekiti State secondary schools?

Table 1: Performance of Secondary School Students in Agricultural Science by Treatment

Teaching Method	N	Pretest		Posttest		Mean Difference
		Mean	SD	Mean	SD	
Jigsaw method	79	12.82	1.83	23.63	3.95	10.81
Conventional method	81	13.67	2.18	16.91	3.78	3.24

Table 1 shows that Agricultural Science students exposed to Jigsaw and conventional methods had mean score of 12.82 and 13.67 respectively prior to treatment. On exposure to treatment, students in the Jigsaw method had the highest mean score of 23.63 while those in the conventional group had the mean score of 16.91. This implies that the performances of students in Jigsaw Method and Conventional Method in Agricultural Science in Ekiti State secondary schools was generally low prior to treatment but improved after treatment.

Research Question 2: What are the influences of gender on students’ performance in Agricultural Science when exposed Jigsaw Method and Conventional Method of teaching in Ekiti State secondary schools?

Table 2: Students’ Performance in Agricultural Science by Gender and Treatment

Teaching Methods	Male					Female				
	N	Pretest		Posttest		N	Pretest		Posttest	
		Mean	SD	Mean	SD		Mean	SD	Mean	SD
Jigsaw	31	12.65	1.74	24.58	3.33	48	12.94	1.90	23.02	4.23
Conventional	26	13.62	2.55	17.81	3.82	55	13.69	2.01	16.49	3.72
Total	109	12.83	2.94	24.87	6.89	129	13.51	2.73	21.10	6.14

Table 2 presents the performance of male and female students before and after being exposed to Jigsaw method and conventional method of teaching in Ekiti State secondary schools. The result shows that the performance of male students exposed to Jigsaw method and conventional method slightly outweighed their female counterparts i.e. Male-Jigsaw = 24.58, Female-Jigsaw = 23.02, Male-Conventional = 17.81, Female-Conventional = 16.49. This implies that there is no gender disparity in the performance of students exposed to Jigsaw and Conventional methods of teaching in Agricultural Science in Ekiti State secondary schools.

Testing of Hypotheses

Hypothesis 1: There is no significant difference in academic performance scores of male and female Agricultural Science students taught with Jigsaw method of teaching.

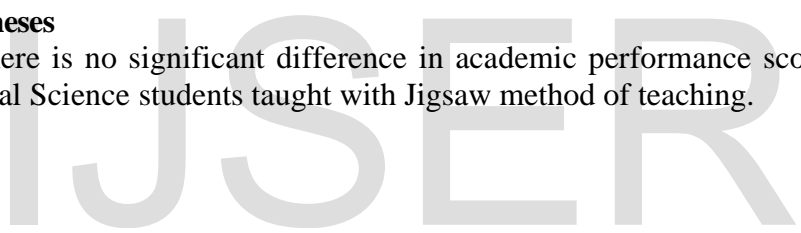


Table 3: ANCOVA showing Students’ Academic Performance in Jigsaw Group by Gender

Source	SS	df	MS	F	P
Corrected Model	49.903	2	24.952	1.623	.204
Covariate (Pretest)	4.077	1	4.077	.265	.608
Sex	43.432	1	43.432	2.825	.097
Error	1168.451	76	15.374		
Total	45341.000	79			
Corrected Total	1218.354	78			

p>0.05

Table 3 shows that the computed F-value (2.825) obtained for the groups with a p-value>0.05 was not significant at 0.05 level. The null hypothesis is not rejected; implying that there is no significant difference in academic performance scores of male and female Agricultural Science students taught with Jigsaw Method. **Hypothesis 2:** There is no significant difference in the attitudinal scores of male and female students exposed to Jigsaw Method of teaching.

Table 4: ANCOVA showing Students’ Attitude to Agricultural Science in Jigsaw Group by Gender

Source	SS	df	MS	F	P
Corrected Model	3431.884	2	1715.942	19.197	.000
Covariate (Pretest)	3377.690	1	3377.690	37.788	.000
Sex	25.260	1	25.260	.283	.597
Error	6793.331	76	89.386		
Total	809452.000	79			
Corrected Total	10225.215	78			

p>0.05

The result on Table 4 shows that the computed F-value (0.283) obtained for the groups with a p-value>0.05 was not significant at 0.05 level. The null hypothesis is not rejected; implying that there is no significant difference in the attitudinal scores of male and female students exposed to Jigsaw Method

Hypothesis3: There is no significant influence of location on students’ attitude towards Agricultural Science when exposed to Jigsaw method of teaching.

Table 5: ANCOVA showing Students’ Attitude towards Agricultural Science Students in Jigsaw Group based on School Location

Source	SS	df	MS	F	P
Corrected Model	3789.412	2	1894.706	22.374	.000
Covariate(Pretest)	3688.186	1	3688.186	43.554	.000
Location	382.788	1	382.788	4.520	.037
Error	6435.804	76	84.682		
Total	809452.000	79			
Corrected Total	10225.215	78			

***p<0.05**

Table 5 shows that the computed F-value (4.520) obtained for the groups with a p-value<0.05 was significant at 0.05 level. The null hypothesis is rejected; implying that there is significant influence of location on students’ attitude towards Agricultural Science when exposed to Jigsaw Method. In order to determine the effect of school location on the attitude of students towards Agricultural Science on exposure to Jigsaw Method, Multiple Classification Analysis (MCA) was carried out as depicted in Table 6.

Table 6: Multiple Classification Analysis (MCA) of Students’ Attitude towards Agricultural Science on Exposure to Jigsaw Method by School Location

Grand mean=100.58					
Variable + Category	N	Unadjusted Devn’	Eta ²	Adjusted For Independent + Covariate	Beta
Rural	39	-1.14	.	-2.23	.
Urban	40	1.12		2.15	

Multiple R	0.577
Multiple R ²	0.333

Table 6 shows that students exposed to Jigsaw Method in urban location had higher adjusted mean score of 102.73(100.58+2.15) on attitude towards Agricultural Science than their counterparts in rural area with an adjusted mean score of 98.35 (100.58+(-2.23)). This implies that school location had influence on the attitude of students exposed to Jigsaw Method towards Agricultural Science. School location accounted for about 37.1% ($\text{Eta}^2=0.371$) of the observed variance in the attitude of students exposed to Jigsaw Method towards Agricultural Science.

Discussion

This study determined the effects of jigsaw method of teaching on senior secondary school students' learning outcomes in Agricultural Science in Ekiti State. The finding of this study showed that performance and attitude of the students towards Agricultural Science were improved upon their exposure to treatment. The result showed that there is significant difference between the pre-test and post-test mean scores of students exposed to jigsaw method of teaching. This implies that jigsaw method of teaching enhances students' performance in Agricultural science, that is, the jigsaw method is a veritable method for enhancing students' performance in Agricultural science. It helps to develop team work and learning skills. This is in agreement with the conclusion of Simsek (2013) that activities that are student centered encourage learners to ask their own questions, carry out their own findings and draw their conclusions. This showed that implementation of jigsaw method will have positive effects on students' performance generally as it affects students' conceptual development positively and keeps their misconceptions at the lowest level. Students' successful experience in managing their own knowledge also helps them solve problems well and this faster improvement in their performance.

The results of this research showed the positive change in the performance of students exposed to jigsaw method of teaching which was due to the students' interaction while solving problem. Also, the idea of giving learner the chance to interact before group presentation gives the learner the opportunity of meaningful contribution without wasting time. This is in agreement with the findings of Isiaka and Mudasiru (2016) that there was significant positive change in the performance of students in Agricultural Science as a result of the method used by the teachers. Also, Nwakorie and Akpata (2004) were of the opinion that when Agricultural teachers select appropriate methods, it would bring about positive change in the attitude of the learners towards Agricultural Science and the performance of the learners. The study also found the interactive effect of the attitude scores of male and female students expose to jigsaw method. This implies that the result was to show the gender effect on attitude after treatment. The result revealed that the null hypothesis was not rejected. This implies that, there was no significant difference in the attitudinal scores of male and female students exposed to jigsaw method. This counters the opinion of Anagbogu, (2002) also supported by Ganai and Muhammed (2013) that expressed that students' academic performance is affected by host of factors which includes individual and household characteristics such as students' ability, motivation, age and gender.

The general belief is that boys are superior to girls in academic performance and in terms of cognition and logical reasoning (Anagbogu, 2002). This was buttressed by Okeke (2003) who asserted that factors that affect students' academic performance include sex role stereotype, masculine image and female socialization process and inability to withstand stress. This research

had been able to establish the fact that gender has no effect on jigsaw method. This implies that gender did not have any significant effect on the learning outcomes of Agricultural Science students.

Conclusion and Recommendations

Based on the findings, it was concluded that jigsaw method of teaching were effective for the teaching of Agricultural Science. The group exposed to treatment had better performance. In addition, jigsaw method of teaching changed attitude of students towards Agricultural Science. It was finally concluded that gender has no impact on the effectiveness of jigsaw method of teaching. Jigsaw method could be used for effective teaching and learning Agricultural Science. Based on the findings of this study, the following recommendations were made:

1. Agricultural Science teachers should encourage their students to work together as in jigsaw method of teaching;
2. Government and administrators should provide relevant materials conducive environment to use jigsaw method because of its effectiveness in teaching Agricultural Science.
3. Agricultural Science students should be allowed to generate and solve problems on their own.
4. Curriculum planners should encourage the teachers for implementation of jigsaw method of teaching.

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