Global Scientific JOURNALS

GSJ: Volume 9, Issue 2, February 2021, Online: ISSN 2320-9186
www.globalscientificjournal.com

EFFECTS OF COMPUTER-BASED AND JIGSAW METHODS 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 of computer-based and jigsaw methods 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 240 senior secondary school II Agricultural Science students. Two instruments were used to elicit information for the study; 'Performance Test for Agricultural Science Students (PTASS)' and 'Students Attitude towards Agricultural Science Scale (SATASS)'. The instruments were validated by experts and reliability coefficients of 0.78 and 0.72 were obtained for PTASS and SATASS respectively. Two research questions and two hypotheses were postulated and tested at 0.05 level of significance. The data collated were analyzed using mean, standard deviation and Analysis of Variance. The findings of the study showed that Computer based and Jigsaw methods were found to improve students' performance in Agricultural science when compared with conventional method. Based on the findings of the study, it was recommended that Government and administrators should provide relevant resources for the use of computer-based and jigsaw methods.

Key words: Computer-Based Method, Jigsaw Method, Learning Outcomes, Agricultural Science

Introduction

A teaching method is the 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. 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, attitude and knowledge to learners making use of appropriate teaching method for desired behavioural change to occur in the learner (Nwachukwu, 2011). 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(Famiwole, 2017).

Teaching pre-supposes an environment where learning can take place. It means the creation of a situation which facilitates learning or leads to learning. Teaching according to Ayeni (2011) is the process which leads to better understanding of the content of the subject matter and it includes instructions, principles, teaching materials, methods, models and innovative devices. It is the activity or set of activities performed by the teacher with the sole intention of bring about learning to

the learner. Learning is the process of acquiring new or modifying existing knowledge, behaviour, skills, values or preferences which may involve synthesizing different types of information. Learning becomes more effective and valued amidst a high level of interaction. Andrews and Henry (2014) argued that when male and female students are actively engaged in the teaching and learning process, they are more responsibly involved in critical and creative thinking. It is therefore paramount that teacher needs to guide or assist the students to actively participate in teaching-learning process. Students are supposed to be more active than being passive during the teaching and learning process. Modern teachers use varieties of teaching methods at their command to make teaching and learning process to be more active and effective (Alaba, 2010).

A variety of teaching methods such as demonstration method, project method, learning by doing among others are used to ensure that all students have equal opportunities to learn. Seweje and Jegede (2005) explained that there is no single method that can be conceived to communicate all the multivarious activities that make up the body of knowledge. They further remarked that high variability in the aptitude and attitudinal dispositions as well as the background of the students suggest the need to employ different methods to facilitate the learning process. Agricultural Science teachers' in secondary schools are expected to use basic but result-oriented methods. However, to heighten innovation in the teaching delivery, variety is key. Therefore, the Agricultural Science teachers are supposed to be innovative in the use of appropriate variety of the teaching methods he/she uses in teaching to enhance learning outcomes. Seweje and Jegede, (2005) identified the following methods as appropriate for teaching in secondary schools; lecture method, discussion method, laboratory method, project method, team-teaching methods among others but the emphasis in this study based on Computer-Based and Jigsaw methods of teaching which is quite different from traditional method.

Jigsaw method of teaching according to De-Bas (2001) is a method of organizing classroom activity that makes students dependent on each other to succeed. It is a method of teaching or strategy of organizing student group work that help students collaborate and rely on one another. This method appears effective for accomplishing multiple tasks at once and for giving students a greater sense of individual responsibility. Jigsaw method allows the teacher to separate students into groups and assignments into smaller pieces, all for accomplishing tasks with more details and collaboration. Jigsaw draws a direct image to a jigsaw puzzle. Just as the final image of puzzle is constructed from many separate piece fitting together, so too are academic tasks completed when members of the team offer unique, jigsaw-cut efforts to the group. If each student's part is essential, then each student is essential; and that is precisely what makes this strategy so effective. When working independently, students are accountable strictly to themselves but jigsaw method gives a sense of ownership and belonging.

On the other hand, computer-based method is a process by which written and visual information are presented in a logical sequence to learners through computer (Muhammad & Munawar, 2012). According to Fakomogbon, Omiola, Awoyemi and Mohammed (2014), Computer- Based Instruction is a set of materials put on audio disk that can be displayed on the computer screen whenever there is need for students to use them. Ganai and Muhammad (2013), referred to computer-based instruction as virtually any kind of computer used in educational setting including drill and practices, tutorials, simulation, games and problem solving. Adepoju and Opele (2018) explained that computer-based instruction is a programme of instruction or package presented as computer software for instructional purpose. It is a self-learning technique usually offline or online engaging the student activity in the learning process using a computer.

Computer-based method for instructional delivery in secondary schools is the topical requirement of everyday life and plays an important role in society globalization. The availability and exponential growth of computer creates unique opportunities for teaching and learning of Agricultural Science in senior secondary schools. It makes possible for emerging disciplinary knowledge and understanding of Agricultural Science processes which are too small, large, slow or fast to be taught. Computer-based instruction is very suitable for developing learners' problem solving skills. Its resources are software programmes that mimic real world phenomena and are highly valued in the learning process. Also, computer-based instruction helps to concretize learning experience, stimulate and motivate learners.

Computer-based instruction according to Wiki educator in Eze (2016) is one-on-one interaction that brings instantaneous responses to the answer elicited. Each student proceeds at his or her own pace and teacher devote more time to individual student. Therefore, this study investigated effects of computer-based instruction and jigsaw method on Senior Secondary School students' achievement in Agricultural Science in Ekiti State.

Statement of the Problem

The primary purpose of teaching at any level of education is to bring a fundamental behavioural change in the learners. This means teaching method is a very critical factor to improving students' performance in Agricultural Science. To facilitate the process of knowledge transmission, teachers are expected to apply appropriate teaching methods that best suit the specific objectives to be achieved. One of the major objectives of teaching Agricultural Science at the junior secondary school level is to stimulate students' interest in Agricultural Science and sustain the interest of students at senior secondary school level. Another objective is to develop practical skills in secondary school students and improve their performance in Agricultural Science.

A look into the secondary school reveals the dwindling interest of students in studying Agricultural Science. The few studying the subject are unskilled to perform major agricultural tasks in livestock husbandry, vaccination of poultry, planting to distance, fertilizer application, artificial insemination, inoculation of legumes, and soil testing among others. The researcher personal experience as secondary school teacher showed that Agricultural Science teachers are used to chalk and talk method such as teacher centred, competitive method that are of low profit.

However, students' poor interest or negative attitude towards studying Agricultural Science may be linked to the misconceptions that Agricultural Science is all about cutting grasses during punishment. Olaitan (2011) recorded that poor learning outcome of student in Agricultural Science may be linked to the type of teaching method employed. Though, teachers with high morale, motivation and a mastery of knowledge are important, but correct use of appropriate teaching methods appears to be critical to successful teaching and learning of Agricultural Science. Similarly, knowledge and skillfulness about how teaching methods could affect students' learning may also help teachers to select methods to improve teaching quality and effectiveness.

The teaching and learning of Agricultural Science in secondary school is centered on certain factors as what to teach, when to teach and how to teach. For teaching to take place, Agricultural Science teachers are expected to stimulate interest through active participation of the students, selection of appropriate teaching methods and learning resources for the students. It is based on this view that the researcher is interested in carrying out an investigation on the effects of Computer-Based and 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 Computer-Based and Jigsaw Methods 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 Computer-Based and Jigsaw Methods enhanced students' performance in Agricultural Science;
2. determined the extent to which the application of Computer-Based and Jigsaw Methods enhanced students' attitude to Agricultural Science;
3. compared the effects of Computer-Based and Jigsaw Methods 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 Computer-Based Method, Jigsaw Method and Conventional Method in Agricultural Science in Ekiti State secondary schools?
2. What are the attitudinal pre-test and post-test mean scores of students to Agricultural Science when exposed to Computer-Based Method, 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 the pre-test mean scores of Agricultural Science students in the Jigsaw Method, Computer-Based Method and the Conventional Method.
2. There is no significant difference in the post-test mean scores of Agricultural Science students when exposed to Computer-Based Method, Jigsaw Method and Conventional method of teaching.

Methodology

The research design used for this study was the quasi-experimental design, employing the 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 240 Senior Secondary School II (SSS II) Agricultural Science Students selected from six Senior Secondary Schools in Ekiti State. 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 two sections A and B. Section A elicited information on respondents' personal data such as gender, name and location of school. Section B consisted 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.

The face and content validity of the instruments were established by experts' judgment in Vocational and Technical Education, Science Education as well as Tests and Measurement for face and content validity. The experts reviewed the items in terms of clarity to ensure that all items that could confuse the respondents are expunged. Based on the comments of these experts, the corrected version was used for data collection. 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 0.78 and 0.72 for 'Performance Test for Agricultural Science Students (PTASS)' and 'Students' Attitude towards Agricultural Science Scale (SATASS)' respectively**.**

The data collected for the study were analyzed using descriptive and inferential statistics. The research questions were answered using descriptive statistics of mean and standard deviation. Inferential statistics of Analysis of Variance (ANOVA) was used to test the hypotheses. Scheffe's Post-hoc analysis was also used to identify the source of significant difference. The hypotheses were tested at 0.05 level of significant. The results are shown below.

Results

Research Question 1: What are the pre-test and post-test mean scores of students in Computer-Based Method, 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	
Computer-Based method	78	13.09	4.01	28.15	6.58	15.06
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
Total	238	13.20	2.84	22.83	6.75	9.63

Table 1 shows that Agricultural Science students exposed to Computer-Based method had mean score of 13.09 while those in the Jigsaw and conventional groups were 12.82 and 13.67 respectively prior to treatment. On exposure to treatment, students in the Computer-Based group had the highest mean score of 28.15, closely followed by those exposed to Jigsaw with the mean score of 23.63 while those in the conventional group had the least mean score of 16.91. This implies that the performances of students in Computer-Based Method, Jigsaw Method and Conventional Method in Agricultural Science in Ekiti State secondary schools was generally low prior to treatment but improved after treatment. The performances of students in Computer-Based Method, Jigsaw Method and Conventional Method in Agricultural Science in Ekiti State secondary schools before and after treatment is further depicted in Figure i.

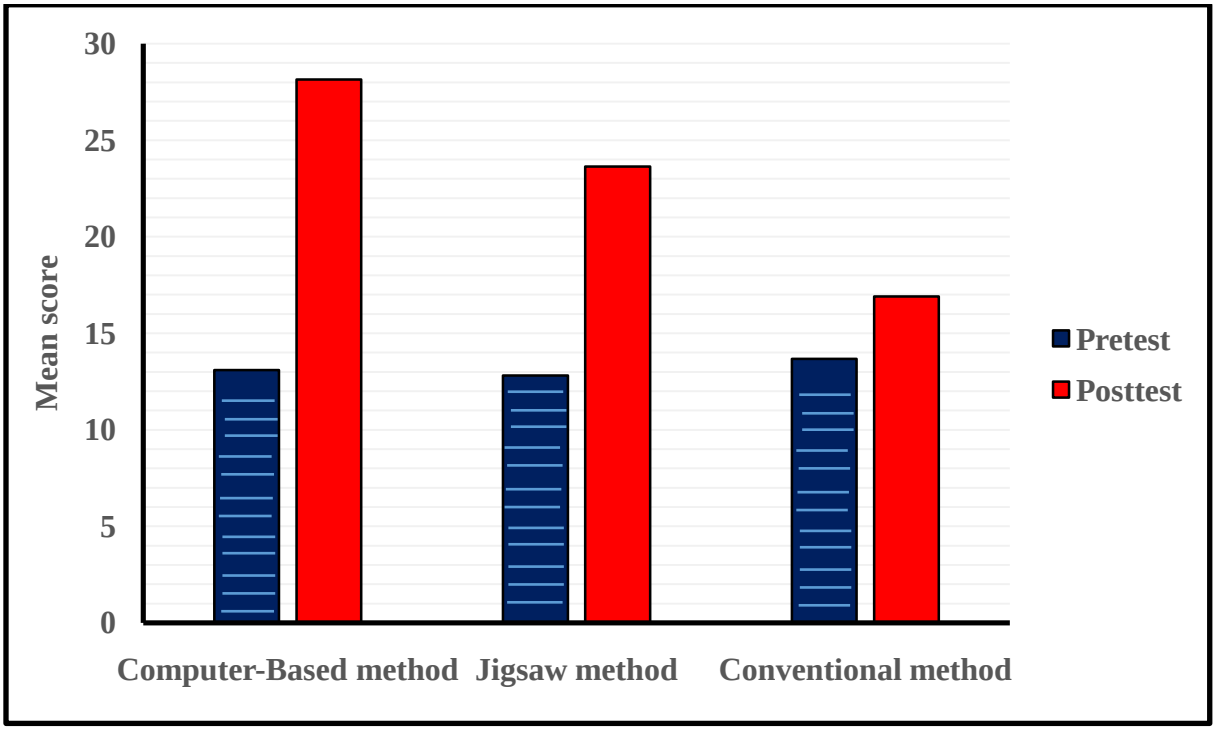

Figure i: Performance of Secondary School Students in Agricultural Science by Treatment

Question 2

What are the attitudinal pre-test and post-test mean scores of students towards Agricultural Science when exposed to Computer-Based Method, Jigsaw Method and Conventional Method of teaching in Ekiti State secondary schools?

Table 2: Attitude of Secondary School Students towards Agricultural Science by Treatment

Teaching Method	N	Pretest		Posttest		Mean Difference
		Mean	SD	Mean	SD	
Computer-Based method	78	57.73	11.26	111.10	12.25	53.37
Jigsaw method	79	58.87	9.79	100.58	11.45	41.71
Conventional method	81	61.17	11.94	69.95	10.72	8.78
Total	238	59.28	11.09	93.61	20.95	34.33

Table 2 shows that Agricultural Science students in the Computer-Based group had pre-attitudinal mean score of 57.73 while those in the Jigsaw and conventional groups were 58.87 and 61.17 respectively. On exposure to treatment, students in the Computer-Based group had the highest mean score of 111.10, closely followed by those exposed to Jigsaw with mean score of 100.58 while those in the conventional group had the least mean score of 69.95. This implies that the attitude of students in Computer-Based Method, Jigsaw Method and Conventional Method towards Agricultural Science in Ekiti State secondary schools was unfavourable prior to treatment but improved after being exposed to Computer-Based and Jigsaw methods of teaching. The attitudes of students before and after being exposed to Computer-Based Method, Jigsaw Method and Conventional Method towards Agricultural Science in Ekiti State secondary schools is further depicted in Figure ii.

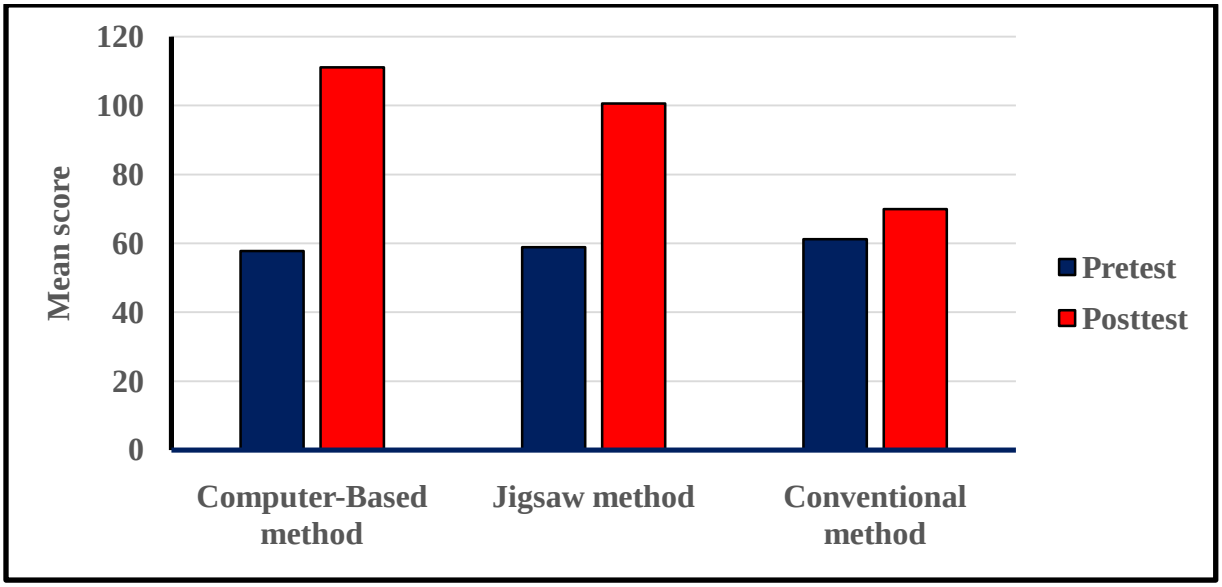

Figure ii: Attitudes of Secondary School Students towards Agricultural Science by Treatment

Testing of Hypotheses

Hypothesis 1: There is no significant difference in the pre-test mean scores of Agricultural Science students in the Computer-Based Method, Jigsaw Method and the Conventional Method.

Table 3: ANOVA showing Students' Performance in Agricultural Science before Treatment

Source	SS	df	MS	F	P
Between Groups	29.828	2	14.914	1.864	.157
Within Groups	1879.891	235	8.000		
Total	1909.718	237			

p>0.05

Table 3 shows that the computed F-value (1.864) 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 pre-test mean scores of Agricultural Science students in the Computer-Based Method, Jigsaw Method and the Conventional Method.

Hypothesis 2: There is no significant difference in the post-test mean scores of Agricultural Science students when exposed to Computer-Based Method, Jigsaw Method and Conventional method of teaching.

Table 4: ANOVA showing Students' Performance in Agricultural Science after Treatment

Source	**SS**	**Df**	**MS**	**F**	**P**
Between Groups	5097.034	2	2548.517	105.164	.000
Within Groups	5694.903	235	24.234		
Total	10791.937	237			

***p<0.05**

The result on Table 4 shows that the computed F-value (105.164) obtained for the groups with a p-value<0.05 was statistically significant at 0.05 level. The null hypothesis is rejected; implying that there is significant difference in the post-test mean scores of Agricultural Science students in the Computer-Based Method, Jigsaw Method and the Conventional Method. In order to locate the sources of pairwise significant difference among the groups, Scheffe post-hoc test was carried out. The result is presented in Table 5.

Table 5: Scheffe Post-hoc Analysis of Students' Performance in Agricultural Science by Treatment

Group	**1**	**2**	**3**	**N**	**Mean**
Computer-Based Method**(1)**		*	*	78	28.15
Jigsaw Method**(2)**			*	79	23.63
Conventional Method **(3)**				81	16.91

***p<0.05**

Table 5 shows that there is significant difference between the performance of students exposed to computer-based method and Jigsaw method at 0.05 level of significance. Similarly, the mean difference groups is statistically significant at 0.05 level in each case.

Discussion

This study determined the effects of computer-based and jigsaw methods of teaching on senior secondary school students' learning outcomes in Agricultural Science in Ekiti State. In order to achieve the purpose of the study, two research questions were raised.

In research question 1, it was observed from the findings that the performances of the students in computer-based method, jigsaw method and conventional method in Agricultural Science in Ekiti State secondary schools was general low prior treatment but improved after treatment. This coincided with Nwachukwu (2011) who stated that Agricultural Science is practical oriented and therefore requires practical instruction and application with the use of appropriate teaching method.

In research question 2, the findings of this study showed that attitude of the students towards Agricultural Science were improved upon their exposure to treatments. The study showed that there was no significant difference in the pre-test performance scores of the students in the experimental and the control groups before treatment. This established the homogeneity of the groups at the beginning of the research. The finding revealed that there is significant difference in the post-test performance scores of the students in experimental and control groups. The findings further showed the effectiveness and reliability of computer-based instruction on the positive increase in the performance of the students studying Agricultural Science at the secondary school level. The findings 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.

The findings revealed that there is significant difference in the post-test performance scores of the students in experimental and control groups. The findings further showed the effectiveness and reliability of computer-based instruction on the positive increase in the performance of the students studying Agricultural Science at the secondary school level. This established the effects of learning at students pace using computer based method. More also, computer-based method has ended up being a successful and beneficial mentality, building up students' retention capacity and boosting the students' performance (Yusuf and Afolabi, 2010). This is buttressed by Owolabi (2018) that computer-based instruction apart from students reinforcing their knowledge, they also develop manipulative skills and attitude needed for business environment. Olori and Igbosan (2016) also buttressed that computer Based instruction appears to have positive effects on students' academic performance, motivation and attitude. It implies that computer-based instruction can help students apply their knowledge in a realistic format and achieve educational goals.

Conclusion and Recommendations

It can be concluded that both computer-based and jigsaw methods of teaching were effective for the teaching of Agricultural Science in Secondary Schools. Each of the group exposed to the treatment had better performance than the students exposed to conventional method. In addition, it can be concluded that the use of computer-based and jigsaw methods of teaching changed attitude of students towards Agricultural Science.

Based on the findings of this study, it was recommended that:

1. Agricultural Science teachers should endeavour to use computer-based and jigsaw methods since both methods were effective in teaching Agricultural Science.
2. Agricultural Science students should be giving orientation concerning the relevance of computer-based and jigsaw methods capable of promoting social interaction.
3. School administrators should provide basic needs such as light for the use of computer-based instruction and conducive learning environment for the use of jigsaw method.
4. Curriculum planners should include the use of Computer-Based and Jigsaw methods in the curriculum.

REFERENCES

Adepoju, E.O. & Opele, J.K. (2018). Awarness, availability and utilization of ICT infrastructure in Nigeira University Library. *International Journal of Research and Design in Technical, Vocational Education and Training TVET – IJORAD.* 2(1), 288 –233.

Alaba, O.A. (2010). *Promoting students' participation: Communicative functions of repair in a Nigeria computer science classroom.* United Kingdom: University of Edinburg, United Kingdom.

Andrew, M. & Henry, O. (2014). Examining the teaching and learning resources related challenges facing small and medium–sized public secondary schools in Kenya: A comparative analysis. *African Educational Research Journal*, 2(2), 72–84

Ayeni, A.J. (2011). Teacher professional development and quality assurance in Nigerian secondary schools. *World Journal of Education*, 1(2), 143-149.

De-Baz, T. (2001). The effectiveness of the Jigsaw co-operative learning on students' achievement and attitudes towards Science. *Science Education International*, 12(4), 6-11.

Eze, G.N. (2016). The challenges of 21st century classroom: The relevance of ICT in UBE. 53rd Annual conference proceedings of Science Teachers Association of Nigeria, pp 278 – 283.

Fakomogbon, M.A., Omiola, M.A., Awoyemi, S.O. & Mohammed, R.E. (2014). Effect of computer assisted instructional package on the performance of students in Mathematics in Ilorin Metropolis. *European Scientific Journal,* 10(25), 196-206.

Famiwole, R.O. (2017). Supervised agricultural experience programmes and work linked education (WLE): Panacea for empowering youths and preventing joblessness. *Journal of Education and Practice*. 6(16), 103-109.

Ganai, M.Y. & Muhammad, A.M. (2013). Comparative study on adjustment and academic performance of college students. *Journal of Educational Research and Essays*, 1(1), 5-8.

Muhammad, K.M. & Munawar, S.M. (2012). Effectiveness of computer assited instruction in Urdu language for secondary students' achievement in Science. Retrieved from memo.languageinindia.com on 16/06/18

Nwachukwu, C.E. (2011). *Designing appropriate methodology in vocational and technical education for Nigeria*. Nsukka: Faladu Publishing Company.

Seweje, R.O. & Jegede, S.A. (2005). *Science education and science teaching method*. Lagos: Atlantic Association publishers.