**ISBN: 978-1- 86888-800 - 9**

**INFLUENCE OF PEER COLLABORATION ON JUNIOR SECONDARY SCHOOL STUDENTS’ ACHIEVEMENT IN BASIC SCIENCE AND TECHNOLOGY**

|  |  |
| --- | --- |
| **Emmanuel J Ohize**  **Department of Industrial and Technology Education**  **Federal University of Technology**  **Minna**  **Niger State**  **E-mail: eohize@futminna.edu.ng** | **Samuel A Owodunni**  **Department of Industrial and Technology Education**  **Federal University of Technology**  **Minna**  **Niger State**  **E-mail: owoscosam@yahoo.com** |

**Abstract–**This study was designed to determine the influence of peer collaboration strategy on Junior Secondary School (JSS) students’ achievement in basic science and technology (BST) in Federal Capital Territory (FCT), Abuja. Three research questions and three hypotheses formulated to guide the study. The design for the study was a quasi-experimental. Specifically, the study adopted a pretest-posttest control group design involving one experimental and one control group. The population of the study consists of all the JSS III students in Gwagwalada and Kwali Area Councils of FCT, Abuja. The sample for the study was made up of 153 (87male and 66 female) students of 4 intact classes. The instrument used for data collection was basic science and technology achievement test (BSTAT). The internal consistency reliability estimate of 0.87 and stability estimate of 0.77 were obtained for BSTAT. The data generated were analyzed using mean, standard deviation and analysis of covariance (ANCOVA). The result of the data analysis showed that peer collaboration strategy facilitated the achievement of the students in BST. The study also showed that gender is not a significant factor on students’ achievement when taught using peer collaboration strategy. Based on the findings it was recommended that BST students irrespective of their gender should be taught using peer collaboration strategy.

**Keywords**: influence, Peer Collaboration, achievement and Basic Science and Technology

**INTRODUCTION**

The knowledge of science and technology has been described as an indispensable for a successful and balanced human existence. Science and technology is a tool needed for effective functioning in any society and serves as foundation for all scientific and technological development (Adegboye, 1997). The study of science and technology in secondary schools builds up in the students, the basic skills, knowledge and competencies needed for scientific and technological development. According to Omosewo, Akanmu and Asebiomo (2013), the accomplishment and realization of these important educational goals in Nigeria depends on the effective implementation of the science and technology curriculum.

Despite the effect of Federal Government of Nigeria to improve the performance of students in science and technology, the achievement of most Nigerian secondary school in science and technology has consistently been to be low and unimpressive (Nenty 2001, Betiku, 2002, George 2008). Annual results from Federal Capital (FCT) Education Resources revealed poor performance of students who enrolled for basic science and technology examination at Junior Secondary School level. From records of Nigerian students’ achievements in JSSCE basic science and basic technology (from 2006-20012) obtained from FCT Education Resources Department of Research, less than forty five percent (45%) of the students who enrolled in basic science and basic technology examination credited the subject while above fifty five percent (55%) either had ordinary pass or failure grade each year (FCT Education Resource Centre, Abuja). This implies a gross underachievement of Nigerian students in basic science and technology.

Report from the various examiners in basic science and technology for Junior Secondary School Certificate Examination 2012 showed that candidates’ answers revealed students ignorance of the basic rudiments of basic science and technology. The report further indicated that many of the candidates could not carry out instructions that were needed to solve the science and technology problems; that the candidates lacked the skills and techniques of presenting the answers coherently. The suggestions are that if no urgent and serious steps are taken to arrest the incident of mass failure of students in the subject, the nation’s scientific and technological developmental desires and expectations may remain a dream. Besides, a good mastery of basic science and technology is required by students in order to do well in other sciences and engineering related fields at senior secondary and tertiary institutions. Students who are handicapped in science and technology are likely to be handicapped in the acquisition of skills in science and technology subjects (Osafehinti, 1990). These observations of consistent poor achievement of junior secondary school students in basic science and technology underscore the need to explore other techniques of teaching the subject such as peer collaboration approach.

Peer which refers to the child’s own friend and mate has a powerful effect on learning (Hoxby, 2000)). Most students feel freer and more interested in asking their fellow classmates questions, where they do not understand, than asking the teacher thereby making the students to develop positive toward the subject. It is even claimed that the most powerful and sustainable learning process occurs among peers who pull each other rather than being pushed by experts or the teacher (Hooper, 1992). In collaborative learning, learning is shared and the more that is shared, the more that is learned. The basic premise is that learning emerges through the shared understanding of multiple learners (Leidner and Jarvenpaa, 1993).

Peer collaboration which is a learner centered strategy has been suggested to minimize passivity and has the potential of enhancing students’ interest and achievements in science and technology since it involves active participation of the learners. What one observes cannot be the same as what one is fully evolved in doing. Peer collaboration has also been suggested to be effective in teaching such subjects like physics (Ahaneku, 2002), chemistry (Anakwe, 2004 & Anyawu, 1993), Mathematics (Samuelsson, 2010; Murray, Xin Ma & Mazur,2009 ). Not much literature seems to be available so far showing the effectiveness of peer collaboration in improving the achievement of junior secondary school students in science and technology especially in basic science and technology.

Though a number of efforts have been made through research, workshops and seminars, science and technology has not secured its rightful position in the mind of students and as a result, interest continue to be low. Science and technology learning especially basic science and technology has continued to be seen as threat to students and this has been attributed to inappropriate teaching methods (Oranu, 2003). Although some other variables might have affected students when learning science and technology, Osafehinti (1990) stressed on teaching methodology as a major problem associated with low interest and poor achievement in science and technology contents.

A number of researchers relevant to gender issue on students’ achievement had been done. Many studies have found out that female students under-achieve in science and technology in relation to their male counterparts (Adigwe 1999, Bateson and Parsons-champman 1998, Madu 2004). However, peer collaboration as a teaching and learning strategy has been suggested to possess a high tendency of bridging this gap between male and female in achievement (Hoxby, 2000)). Since peer collaboration involves the development of rational critical thought processes in the students as they explore, question, discuss, discover and cooperate among themselves, exposing them to the strategy may bridge the gender gap usually observed in science and technology achievement. Peer collaboration strategy seems to possess the potential of offering students equal opportunity of learning. According to Adigwe (1999), equal exposure to effective teaching methods could lead to the reduction of gender differences in learning. This study, therefore, seeks to investigate the effect of peer collaboration on junior secondary school students’ achievement in basic science and technology.

**STATEMENT OF THE PROBLEM**

Students’ achievement in science and technology has been observed to be generally poor and discouraging. The poor achievement has been linked to the low interest exhibited by the students in the study of the subject and apathy towards science and technology as a subject. Observation has shown that in the Nigerian classrooms, teachers dominate the teaching and learning processes and students’ participation are usually very minimal. Literature evidence suggest that teachers’ use of ineffective methods and strategies in teaching science and technology have among other factors contributed to the students’ low interest and achievement in science and technology. This situation calls for the need to examine the effectiveness of some other teaching approaches such as peer collaboration.

**THEORETICAL FRAMEWORK**

Learning theories if well explain predict behaviour. According to Merril (1997), they open our eyes to other possibilities and ways of seeing the world. Most design decisions are certainly based on the knowledge of learning theories. Shwirer (1997), pointed out that, the function of instructional design is more of an application of theory rather than a theory itself. Based on this, cognitive, social motivation and social cohesion theories of learning are reviewed in the study.

The cognitive learning theory sees learning as a reorganization of knowledge structure. The knowledge structures are stored in semantic memory as schema or cognitive maps (UNESCO, 2002). Shell (1986) noted that the main emphasis of cognitive theory is on sequence of learning materials and experiences in a well organized environment so as to create order, meaningfulness and understanding, that is, learner-environment interacting meaningfully.

The developmental psychology of Jean Piaget also recognizes the active role of both learner and his environment in the learning process. Piaget asserts that the basis of all learning is the learner’s activity as he interacts with his physical and social environment. For learning to take place, the environment must be stimulating and encouraging learning (Nwachukwu, 1995). Based on his research on the development of learner’s cognitive functions, Piaget observed that learning occurs through adaptation to interactions with the environment. Disequilibrium (mental conflict which demands resolution) gives rise to Assimilation of a new experience, which is added to the existing knowledge of the learner, or to Accommodation, which is modification of existing understanding to provide for the new experience (UNESCO, 2002).

Specifically, Piaget posited that the existing cognitive structures of the learner determine how new information is perceived and processed. If the new information makes sense to the existing mental structure of the learner, then the new information item is incorporated into the structure (i.e., Assimilation). If, however, the information is very different from the existing mental structure of the learner, the information is transformed in ways that it fits into the mental structure (i.e., Accommodation) (Ngwoke and Eze, 2004). The learner has an active role in constructing his or her own knowledge in both of these ideas. According to UNESCO (2002) Piaget was of the notion that as children assimilated new information into their existing mental structures, their ideas gained complexity and power, and their understanding of the world grew in richness and depth. These ideas are core concepts of the constructivism view of the learning process.

Bruner in his own theory emphasized that learning is an active process in which learners construct new ideas or concepts based upon their prior knowledge and experience (Nwachukwu, 1995). According to UNESCO (2002) Bruner identified three principles that guide the development of instruction. These include: (1) instruction must be concerned with the experiences and contexts that make the student willing and able to learn (readiness); (2) instruction must be structured so that the student can easily grasp it (spiral organization); and, (3) instruction should be designed to facilitate extrapolation and/or fill in the gaps (going beyond the information given).

Other common theories that are related to peer collaboration include social-motivational (Slavin, 1986; Stevens, Madden, Slavin, & Farnish, 1987), social-cohesion (Johnson & Johnson, 1991),

sociocultural (Scardemalia, Bereiter, & Lamon, 1994), cognitive-elaboration (O’Donnell, 1999; Palinscar & Herrenkohl, 2002), and Piagetian and Vygotskian theories (Delisi, 2002; Hogan & Tudge, 1999). Social-motivational and social-cohesion approaches emphasize the motivational aspects of peer learning more than cognitive processes involved in peer learning (Slavin, 1986). In contrast, cognitive-elaboration and the developmental Piagetian and Vygotskian theories focus more on the cognitive and social-cognitive processes of peer learning with less emphasis on motivational aspects (e.g., O’Donnell et al., 1990). Social-motivational theories posit that rewards provided to the group as a whole will motivate each member to work hard at the task, which leads to more effective learning (Slavin, 1996), while the cognitive-elaboration perspective holds that students learn in collaborative situations through heightened use of processing activities (O’Donnell, 1999).The theories also drive the way in which students are grouped, the directions they receive, and the goal and reward structure provided while they collaborate (O’Donnell, 2006; Webb & Palinscar, 1996). Conclusively, the theories discussed so far believe in the environmental influences on the learner’s achievement in learning and that meaningful learning occur as learner and his environment are always participating in a simultaneous mutual interaction.

**PURPOSE OF THE STUDY**

The study sought to determine:

1. The effect of peer collaboration on students’ achievements in basic science and technology.

2. The effect of peer collaboration on achievements of male and female students in basic science and technology.

3. The interaction effect of methods and gender on students’ achievements in basic science and technology

**RESEARCH QUESTIONS**

1. What are the mean achievement scores of students exposed to peer collaboration strategy and those not exposed in basic science and technology?

2. What are the mean achievement scores of male and female students taught basic science and technology using peer collaboration strategy?

3. What is the interaction effect of method and gender on students mean achievement scores in basic science and technology?

**HYPOTHESES**

The following null hypotheses were tested at 0.05 level of significance.

HO1: There is no significant difference in the mean achievement scores of students exposed to peer collaboration strategy and those not exposed to the strategy in basic science and technology.

HO2: There is no significant difference in the mean achievement scores of students taught basic science and technology using peer collaboration strategy.

HO3: There is no significant interaction effect of method and gender on students mean achievement scores in basic science and technology.

**RESEARCH METHODS**

The design of the study was quasi-experimental research design. The researchers make use of pre-test, post-test non-equivalent control group design. The researcher randomly assigned intact classes to treatment and control groups. This was necessary in order not to disrupt the normal classes of the students and the school time-table. The design is symbolically represented as follows:

Treatment group O1 X1 O1

Control group O1 X2 O1

Where

O1 stands for Pre-test and Post-test

X1 stands for treatment PC (peer collaboration)

X2 stands for Conventional method

**Population for the Study**

The study was carried out in Gwagwalada and Kwali area councils of Federal Capital Territory Abuja. The population of consist of all the 2011/2012 JSS III students numbering 5024 (2540 males and 2484 females) in Gwagwalada and Kwali Area Councils (FCT education Resources Centre 2012). The sample consists of 153 students (87male and 66 female) in the four intact classes randomly selected for the study. Purposive sampling technique was used to select the four co-educational schools with at least two streams for the study. The two co-educational schools were randomly assigned to treatment and control group and in each school; two intact classes were randomly selected and used for the study. The reason for the use of co-educational primary schools is to take care of the gender variables in the study. Co-educational schools were also chosen because there are no single sex schools in the study area.

**Instrument for Data Collection**

The instrument used for the study was Basic Science and Technology Achievement Test (BSTAT). The test items were generated based on the stated objectives of basic science and technology curriculum for JSS and the time required to teach each unit (Federal Ministry of Education, 2013). The achievement test consists of 20 multiple choice questions (See appendix). The BSTAT was subjected to both face and content validation. The BSAT was face validated by giving the test blue print for the instrument to three specialists, two in basic science and technology education and one in measurement and evaluation. The specialists were required to determine whether the number of items testing each level of knowledge mirrors the level of objectives in the curriculum. The content validity was assured using the test blue print validated by the experts in generating the test items. They examined the test items generated in relation to the test blue prints to be sure that the items reflect the specification in the blue print.

The BSAT was trial tested using 30 students in primary six a co-educational junior secondary school in Kogi Local Government Area of Kogi State. The data obtained through the trial testing was used to determine the internal consistency of the items. This was achieved through the use of Cronbach alpha method since the obtained scores were not dichotomously scored. The obtained internal consistency reliability estimate is 0.87. This suggests high reliability of BSTAT. In order to determine the stability of BSTAT over time, a test retest analysis using Pearson correlation method was conducted and a Pearson r of 0.77 was obtained. This is necessary since the same test, though to be reshuffled, will be used for both pretest and posttest.

**Lesson Plan**

Daily lesson plan were developed to guide the teaching of Basic science and technology in the treatment group using peer collaboration strategy. Conventional lesson plans were also planned for teaching the students in the control group. These lesson plans were based on the contents to be covered in the study and the objectives as indicated in the curriculum. These lesson plans highlighted the objectives to be achieved, the instructional materials, strategies, entry behaviour, the teachers, activities, learners, activities and the evaluation techniques. These lesson plans were designed for the six weeks period of treatment. There are 12 lesson plans in all, six for treatment group and six for control group. Each lesson plan covered one week. To ensure the usefulness of the lesson plans in achieving the desired objectives, they were given to experts in science and technology education for review, criticism and suggestions for further improvement. Their comments and inputs were used in providing the final form of the lesson plans. To further determine the suitability of the lesson plan in achieving the desired purpose, it was subjected to field trial using sample from outside the study area. Observations made during the field trial helped in improving the lesson plans. However to ensure effective implementation of the study programme, the class teachers that used the two set of lesson plans were trained by the researcher.

**Experimental Procedure**

On the first day, before the lesson commences, the BSTAT pretest were administered to both the experimental and control groups after which proper teaching commenced by using the prepared lesson plans. The pre-test helped to ascertain the subjects, level of Basic science and technology achievement and interest before the experiment and to determine how equivalent the two groups were before the treatment. The teacher for each group was supervised by the researcher during the teaching process to be sure they did not deviate from the prepared lesson procedure. Each lesson lasted for 70 minutes and the treatment lasted for 6 weeks. At the end of the treatment, a posttest was administered on both groups with the BSTAT; the scores obtained from both groups were compared to determine if there is any significant difference in the performance of the two groups.

The data collected was used for further analysis; therefore they were collected and kept under the custody of the researcher.

**Method of Data Analysis**

Data collected for this study were analyzed using mean and standard deviation to answer all the research questions. The null hypotheses were tested using Analysis of Covariance (ANCOVA) at 0. 05 level of significance.

**RESULTS**

The results of data analysis were presented according to the research questions and hypotheses that guided the study.

**Research Question One**

What is the influence of peer collaboration strategy on pupil’s academic achievement in basic science and technology?

**Table 1: *Mean Scores and Standard Deviation of Experimental and Control Groups in the Academic Achievement Test***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Group | N | pretest | | Posttest | | Mean Gain |
|  |  |  | SD |  | SD |  |
| Experiment | 79 | 5.53 | 4.45 | 29.83 | 3.87 | 24.30 |
| Control | 74 | 5.77 | 3.88 | 16.63 | 2.57 | 11.14 |

Result presented on Table 1 show the pretest and posttest means scores and standard deviations of students exposed to peer collaboration strategy and those not exposed. The data show that experimental group had pretest mean score of 5.53 with a standard deviation of 4.45 and posttest mean score of 29.83 with a standard deviation of 3.87. The pretest posttest mean gain score is 24.30. The students in the control group had pretest mean score of 5.77 with a standard deviation of 3.88 and a posttest mean score of 16.63 with a standard deviation of 2.57. The pretest posttest mean gain score is 11.14. The close range in the standard deviations observed in the score of both treatment and control groups showed that their scores were homogeneous. From the data presented, it could be inferred that students exposed to peer collaboration achieved better than those in the control group suggesting that peer collaboration facilitated more students’ achievement in basic science and technology than the conventional method of teaching.

**Research Question 2**

What are the mean achievement scores of male and female students taught basic science and technology using peer collaboration strategy?

**Table 2: *Mean scores and standard deviation of Male and Female Students Taught* basic science and technology *in the achievement test***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Group | N | pretest | | Posttest | | Mean Gain |
|  |  |  | SD |  | SD |  |
| Experiment | 87 | 5.28 | 4.90 | 30.58 | 6.10 | 25.30 |
| Control | 66 | 5.87 | 3.78 | 28.89 | 6.79 | 23.01 |

Table 2 shows that male students taught basic science and technology with peer collaboration had a mean score of 5.28 and standard deviation of 4.90 in the pretest and a mean score of 30.58 and standard deviation of 6.10 in the posttest making a pretest, posttest mean gain of male students taught with peer collaboration strategy to be 25.30. Female students taught basic science and technology with peer collaboration strategy had a mean score of 5.87 and standard deviation of 3.78 in the pretest and a posttest mean of 28.89 and standard deviation of 6.79 with a pretest, posttest mean gain of 23.01. The close range in the standard deviations observed in the score of both treatment and control groups showed that their scores were homogeneous. With these results male students taught basic science and technology had higher mean scores than female students in the achievement test. Thus, there is an influence attributable to gender on the achievement of students taught basic science and technology.

**Research Question Three**

What is the interaction effect of treatment methods and gender on students’ means interest scores in basic science and technology?

**Table 3: Mean Scores of Students on BSAS by Treatment and Gender**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Treatment Groups | Gender | N |  | SD |
| Experimental | Male | 43 | 30.48 | 3.78 |
| Female | 36 | 28.94 | 4.10 |
| Control | Male | 44 | 17.45 | 2.89 |
| Female | 30 | 15.78 | 3.23 |

The data presented in Table 3 indicate that male students exposed to treatment using peer collaboration had post treatment mean achievement score of 30.48 and standard deviation of 3.78 while male students in control group had post treatment mean achievement score of 17.45 and standard deviation of 2.89. Female students in the experimental group had post treatment mean achievement score of 28.98 and standard deviation of 4.10 while female students in the control group had post-achievement mean score of 15.78 and standard deviation of 3.23. With this result, both male and female students in the experimental group achieved higher mean achievement score than male and female students in the control group. This suggests that both males and females exposed to peer collaboration consistently benefitted more than those in the control group.

**Hypotheses**

The following null hypotheses were tested at 0.05 level of significance.

HO1: There is no significant difference in the mean achievement scores of students exposed to peer collaboration strategy and those not exposed to the strategy in basic science and technology.

HO2: There is no significant difference in the mean achievement scores of students taught basic science and technology using peer collaboration strategy.

HO3: There is no significant interaction influence of method and gender on students mean achievement scores in basic science and technology.

**Table 4: Summary of Analysis of Covariance (ANCOVA) for Test of Significance between the Mean Scores of Experimental and Control groups in the Achievement Test, Influences of Gender and Interaction Influence of Treatments given to Students and their gender with respect to their mean scores on the basic science and technology Achievement Test**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Source | Sum of Squares | | Df | Mean Square | F | | Sig. |
| Corrected Model | 6234.423a | | 4 | 1041.555 | 33.654 | | .000 |
| Intercept | 2123.123 | | 1 | 2123.123 | 284.567 | | .000 |
| Pretest | 148.342 | | 1 | 148.342 | 5.871 | | .381 |
| Group | 3994.23 | | 1 | 3994.23 | 78.879\* | | .000 |
| Gender | 41.651 | | 1 | 41.651 | 1.344\* | | .071 |
| Group \* Gender | 59.678 | | 1 | 59.678 | 1.114 | | .251 |
| Error | | 7841.856 | | 120 | | 50.313 | |
| Total | | | 89947.000 | | 125 | | |
| Corrected Total | | | 13416.439 | | 123 | | |
|  | | |  | |  | | |

\*Significant at sig of F< .05

The data presented in Table 4 shows F-calculated values for mean scores of experimental and control groups in the achievement test, gender and interaction influence of treatments and gender on students’ achievement in basic science and technology. The F-calculated value for Group is 78.879 with a significance of F at .000 which is less than .05. The null-hypothesis is therefore rejected at .05 level of significance. With this result, there is a significant difference between the mean achievement scores of students taught basic science and technology with peer collaboration strategy and those taught with conventional method. The F-calculated value for gender is 1.344 with a significance of F at .071 which is more than .05. This means that there is no significant difference between the effects of Gender on students’ achievement in basic science and technology. Therefore, the null hypothesis of no significant difference between the effect of gender (male and female) on students’ achievement in basic science and technology is not rejected at .05 level of significance. The interaction of treatments and gender has F-calculated value of 1.114 with significance of F of .251. Since .251 is higher than .05, the null hypothesis for interaction influence of treatment and gender is accepted. Hence, there is no significant interaction influence of treatments given to students and their gender with respect to their mean scores on the basic science and technology Achievement Test.

**DISCUSSION OF FINDINGS**

The results of this study indicate that the use of peer collaboration strategy has a significant influence on students’ achievement in basic science and technology. The students taught basic science and technology using peer collaboration strategy performed significantly better than the group taught the same concept using conventional method. This result is in agreement with some earlier research finding on the effect of peer collaboration on students’ academic achievement. Studies conducted by Adeoye (2002), Murray, Xin Ma & Mazur, (2009); Samuelsson, (2010) and are supported by the findings of this study. The studies carried out by Samaha & DeLisi (2000) and Ahaneku (2002) confirmed that peer collaboration has positive effect on students academic achievement. This is also in consonance with the works of Fawcett & Garton, (2005). and Ullah & Wilson, (2007)which confirmed that peer collaboration strategy has a great impact on the students’ academic achievement. The better achievement of students taught using peer collaboration strategy could have been the consequence of active involvement of the students as they asked questions, exchanged ideas, differed in opinions, discussed, argued and finally arrive at a conclusion by solving the task. The fact that the instruction was conducted in small groups which enabled every pupil to teach, ask, clarify, monitor and summarize instruction may had contributed to the significant influence of peer collaboration strategy on basic science and technology achievement.

The result of this study can be attributed to the fact that peer collaboration offers students equal opportunity of learning and thereby possess a high tendency of bridging the gap between male and female in achievement. Therefore, the non significant difference in the achievement of male and female is attributed to peer collaboration strategy used during instruction. This enabled the active participation of both male and female students as they collaborated in groups sharing and constructing ideas through braining storming and exploration.

The results of this study show that there is no significant influence of gender on the students’ achievement in basic science and technology when exposed to peer collaboration strategy. In other words, it suggests that gender is not a significant factor in students’ achievement in basic science and technology when taught using peer collaboration strategy. This finding is in agreement with the study conducted by Owodunni (2011) which revealed that gender has no significant effect on achievement when exposed to a reflective inquiry instructional technique; that being a boy or a girl did not directly contribute to any substantial difference in the level of students’ achievement. This indicates that the relative influence of treatment was consistent across the two level of gender suggesting that both the male and female students benefit significantly from the peer collaboration strategy instruction. Thus gender was not a factor in the effect of peer collaboration on students’ achievement in basic science and technology. However, the finding of the study in respect to gender and achievement contradicts some previous research results. For instance, Anyanwu (2003); Batiku (2002) separately reported that gender has a significant effect on achievement.

**CONCLUSIONS**

This study has shown that the use of peer collaboration strategy has a facilitative influence on students’ achievement in basic science and technology. There is a significant difference in basic science and technology mean achievement scores between students exposed to peer collaboration strategy and those who use conventional method. Gender has no significant influence on students’ achievements in basic science and technology when taught using peer collaboration strategy. Thus, gender is not factor in the basic science and technology achievement of students when exposed to peer collaboration. There is no significant interaction effect of treatment and gender on student students’ achievement in basic science and technology. The effects of treatment on achievement of the pulps were not as a result of gender.

**Implications of the Study**

The result of this study has some important educational implications. It has provided an empirical evidence of effectiveness of the use of peer collaboration strategy to build up and enhance students’ achievement in basic science and technology. This suggest the need for teachers particularly science and technology teachers to adopt the use of peer collaboration which could be developed in accordance with the prescribed characteristics in peer collaboration strategy.

The fact that peer collaboration strategy was shown to enhance students’ achievement in basic science and technology implies that the authors of textbooks for the students should pay proper attention to the teachers and students activities in planning their texts. In other words, the inclusion of teachers and students in activities in the textbooks will create the opportunity of active participation of the learners. Teachers who are the curriculum implementers should use various learning/teaching strategies, like peer collaboration which a beneficial to the students rather than using the strategies which are easy but do not have any positive effect on the students.

**Recommendations**

Based on the findings and implications of this study, the following recommendations are suggested

1. Teachers should not dominate the lesson; they should carefully guide and expose the students to peer collaboration strategy; they should pay greater attention to students’ activities when planning their lessons.

2. School administrators should always keep their eyes on the current teaching/learning strategies; holding seminars, workshop and in-service training for their teachers.

3. Administrators should also make appropriate and regular supervisions in the schools so as to ensure that the teachers are making appropriate lesson plan that will enable the students to actively participate in the lessons.

4. Government and relevant professional associations such as science teachers association of Nigeria should sponsor further research on the efficiency of peer collaboration strategy on the other science subjects.

**REFERENCES**

Adegboye, A.O (1997). Performance of Students in Nigerian School Science and Technology Examination. An Index for the Future of Science and Technology Education. *Journal of Educational Review.* ABUJER, (1), 14-21.

Adeoye, R.Y (2002). Effect of Peer Interaction on Students, Cognitive Achievement and Interest in Physics. *Unpublished Thesis.* University of Nigeria, Nsukka

Adigwe, J.C (1999). Gender Difference in Chemical Problem Solving Among Nigerian Students. *Research, Science and Technological Education* 10(2) 187-201.

Ahaneku, N.R (2002). Effect of Students’ Interaction Patterns on Cognitive Achievement in Physics in Ofu Local Government Area of Kogi State. *Unpublished Thesis.* University of Nigeria, Nsukka.

Anakwe, M.C (2004). Effect of Students’ Interaction Patterns on Cognitive Achievement, Retention and Interest in Chemistry. *UnpublisehedThesis.* University of Nigeria, Nsukka.

Anyanwu, N.A (2003). Effect of Students’ Interaction Patterns on Cognitive Achievement in Science Process Skill Acquisition. *Unpublished Thesis.* University of Nigeria, Nsukka.

Bateson, D & Parson-Chapman, S (1998). Sex-Related Difference in Science Achievement: A Possible Testing Artifact. *International Journal of Science Education.* (4), 271-285.

Betiku, O.F. (2002). Differential Performance of Students in some Newly Introduced Topics in Senior Secondary School Mathematics. Vol. 6 Pp. 15-25 NERDC. Abuja.

De Lisi, R. (2002). From marbles to instant messenger: The implications of Piaget’s ideas about peer cooperation for educational practice. *Theory into Practice, 41, 5-12*.

Fawcett, M. L. & Garton, F. A. (2005). The effect of peer collaboration on children’s problem-solving ability. *British Journal of Educational Psychology (75) 157–169*

Federal Ministry of Education (2013) *Basic Science and Technology Curriculum*. Nigerian Educational Research and Development Council

Federal republic of Nigeria (2004). *National Policy on Education*. Abuja: NERDC

George,P.(2008). Interest and mathematics Achievement in Problem Solving Aproach. Retrived on 3/8/09 from *http://www.edu.intermap.org*.

Hogan, D. M., & Tudge, J. R. H. (1999). Implications of Vygotsky’s theory for peer learning. In A. M. O’Donnell and A. King (Eds.) Cognitive perspectives on peer learning (pp. 39-65). Mahwah, NJ: Lawrence Erlbaum Associates Publishers.

Hooper S.(1992). The effect of interaction on learning during computer based mathematics instruction. *Journal of research 85,180-85*

Hoxby, C (2000). Peer Effects in the Classroom: Learning from Gender and Race Variation. *The national Bureau of economic Research NBER Working Paper No. 7867*

Johnson, D. W., & Johnson, R. T. (1991). Learning together and alone: Cooperative, comptetitive, and individualistic learning. Englewood Cliffs, NJ: Prentice Hall

Leidner, D.E & jarvenpaa S.L (1993). The information age confronts education: case studies on electronic classroom. Information systems research,(1) 24-54

Madu, B.C (2004). “effect of a constuctivist-based instructional model on students conceptual change and retention in physics” unpublished thesis. University of nigeri Nsukka.

Merril, C. E. (1997). *The subject curriculum grades*: Glumbus: Owio, Books Inc.

Moshman, D., & Geil, M. (1998). Collaborative reasoning: Evidence for collective reality. *Thinking and Reasoning 4, 231–248*

Murray, S., Xin Ma & Mazur, J. (2009) Effects of Peer Coaching on Teachers' Collaborative Interactions and Students' Mathematics Achievement. *The Journal of Educational Research (102)3:203-212*

Nenty,J.H.(2001). Common errors and performance of student in senior secondary mathematics certification examinations in cross river state of Nigeria. *Global journal of pure and applied science 7(3), 591-596*

Ngwoke, D. U., & Eze, U. N. (2004). *Developmental psychology and education*. .Enugu: Magnet Business Enterprise

Nwachukwu, T. A (1995). *Psychology of learning*. Enugu: De Sandex (Nig) Ltd

O’ Donnell, A. M., & King, A. (1999). *Cognitive perspectives on peer learning*. Mahwah, NJ: Lawrence Erlbaum Associates Publishers.

O’Donnell, A. M. (2006). *The role of peers and group learning*. In P. Alexander & P. Winne (Eds.) Handbook of educational psychology (2nd ed; pp. 781-802). Mahwah, NJ: Lawrence Erlbaum Associates.

Omosewo, O. E., Akanmu, M. A., Asebiomo, M. A. (2013). Evolution of Functional Basic and Senior Secondary Education Curriculum in Nigeria: Implications for Effective Implementation. *Journal of Education and Practice (4)22 pp73-79*

Oranu, R. N (2003). Vocational and technical education in Nigeria. Retrieved on July 18, 2005 from *http://www.ibe.co.org/curriculum/Africapdf/lago2ora.pdf*

Osafehinti, I.O. (1990). The University of Mathematics. ABACUS: *Journal of mathematics association of Nigeria 20 (1) 47-56.*

Owodunni, A. S. (2011). Effects of Collaborative learning method on students academic achievement in Electrical Installation in Technical colleges. *Nigerian Journal of Education, Health and Technology Research (3)1 pp 147-154*

Palinscar, A. S., & Herrenkohl, L. R. (2002). Designing collaborative learning contexts. *Theory Into Practice, 41, 26-32.*

Samaha, N. V., & DeLisi, R. (2000). Peer collaboration on a nonverbal reasoning task by urban minority students. *Journal of Experimental Education,69(1), 5–14.*

Samuelsson, J (2010).The Effect Of Peer Collaboration On Children’s Arithmetic And Self-Regulated Learning Skills. *Necatibey Faculty of Education Electronic Journal of Science and Mathematics Education (4) 2, pp. 130-153.*

Scardamalia, M., Bereiter, C., & Lamon, M. (1994). *The CSILE project*: Trying to bring the classroom into the world 3. In K McGilley (Ed.), Classroom lessons, integrating cognitive theory and classroom practice (pp.201-228). Cambridge, MA: MIT Press.

Shell, T. J. (1986). Cognitive conception learning. *Review of Educational Research*, 56 (4), 41-46

Shwires, R. A. (1997). *Issues in emerging interactive technology*. In G. J. Anglin (Ed) instructional technology: Past, present and future. (2ND ED. PP 119-127). Englewood, Co. Libraries Unlimited, Inc.

Slavin, R. J. (1986). Using student team learning (3rd ed.). Baltimore, MD: Johns Hopkins University.

Slavin, R. J. (1996). Research on cooperative learning and achievement: What we know, what we need to know. Contemporary Educational Psychology, 21, 43-69.

Stevens, R. J., Madden, N. A., Slavin, R. E., & Farnish, A. M. (1987). Cooperative integrated reading and composition: Two field experiments. *Reading Research Quarterly, 22(4), 433-454.*

Ullah, H. &Wilson, M. A. (2007) Students' academic success and its association to student involvement with learning and relationships with faculty and peers. *College Student Journal Publisher: Project Innovation (Alabama) Audience: Academic Format: Magazine/Journal Subject: Education (41)4*

UNESCO, (2002). Information and communication technology in teacher education. Retrieved May 10, 2005 from *http://www.unesdoc.org/images/0012/001295/129533epdf*

Webb, N. M, & Palinscar, A. S. (1996). Group processes in the classroom. In D. C. Berliner and R. C. Calfee (Eds). Handbook of educational psychology, (pp. 841-873). New York: Macmillan.