# EFFECTS OF COOPERATIVE LEARNING AND PEER- TEACHING ON SECONDARY SCHOOL STUDENTS' ACHIEVEMENT IN BASIC TECHNOLOGY IN MINNA, NIGER STATE

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**Abstract**
*This study examined the effects of cooperative learning and peer teaching on secondary school students' achievement in basic technology. Two research questions and one hypothesis was tested in efforts to find solutions to the problems of the research work. The research work used quasi-experimental design type. One hundred and ten basic technology students drawn from Secondary Schools in Minna, Niger State were used for the work. The cooperative learning and peer –teaching groups were the experimental groups while the conventional teaching method group was treated as the control group. Validated Basic Technology Achievement Test (BTAT) and Basic Technology Interest Inventory (BTII) were administered to the students as pre-test and post-test for collection of data. The BTAT had reliability index of 0.689 while BTII had reliability index of 0.7121. The data collected from the pre-test and post-test were collated and analyzed. The mean scores were used to answer the research questions. Analysis of covariance (ANCOVA) was used to test the hypotheses at 0.05 level of confidence. Some of the results obtained from the research work were as follows: Cooperative learning and peer – teaching were efficacious in enhancing students' achievement in difficult Basic Technology concepts. 2. Cooperative learning was more effective than the peer-teaching in enhancing students' achievement and interest in basic technology. It was recommended among others that Cooperative learning and peer – teaching should be emphasized and incorporated into the basic technology – teacher education curriculum in Secondary Schools Basic Technology courses.*

**Keywords:** Basic Technology, Students' achievement, students' interest, Cooperative learning, Peer teaching.

## Introduction

Basic Technology according to the National Policy on Education (NPE, 2004) is a pre – vocational subject offered at the junior secondary school level. It is an integration of topics from Electricity, Electronics, Woodwork, Technical drawing, Food, Rubber, Plastic and Ceramics Technology. Its aim includes among others, to enable youths to have an intelligent understanding of the increasing complexity of technology. Basic technology is therefore a preparatory aspect of vocational education, which according to Okoro (1999) is any form of education whose primary purpose is to prepare individuals for employment in recognized occupations.

The lecture method which is predominantly used in teaching Basic Technology is based on the behavioural learning theories. According to (Udochukwu, 2008) lecture method emphasizes knowledge transmission from the teacher to passive students, encourage rote memorization of facts. The consequence of this is that students are unable to retain their learning and to apply it to new situations. The shortcomings of the present teaching method partly accounted for the poor performances of students in Basic technology in their Junior School Certificate Examination (JSCE) in recent years (Nwoji, 2000). This poor performances could also affect their work when employed on graduation

Cooperative learning is a technique which allows students to learn from each other and gain important interpersonal skills. Alice (2000-2007) stated that cooperative learning is an organised and structured way to use small groups to enhance student learning and interdependence. She further identified three groups for cooperative learning: These are the base or home group, the formal group and the informal group. The teacher, who adopts the formal cooperative learning strategy, organizes the students in small groups of between four to six members. Each group should be heterogeneous in ability and socio-cultural background; members work jointly through a given instructional assignment until every member successfully understands, and completes the assignment. The students are rewarded in their groups.

Peer- teaching is an instructional strategy in which groups of children under the guidance of the teacher work together through a given instructional assignment with brilliant child, the peer teacher; providing assistance and instruction to others, the peer students. Peer- teaching is also theoretically based on the conceptions of the cognitive theorists like Vygotsky who proposed the zone of proximal development. The proposal points to the child's ability to profit from interaction with more competent peers. (Igbo, 2009).

The teacher who adopts the peer teaching strategy will identify the high, middle and low achievers amongst the students. The high achievers are used as the peer teachers and middle/low achievers are assigned in their small numbers to the peer teachers for instruction and assistance. The teacher prepares the lesson plan and reviews it for the peer teachers in sequential order. He also trains the peer teacher on how to inform, reward and relate to the students.

Both the cooperative learning and peer teaching are child-centred instructional approaches, which is an approach recommended on the National Policy on Education for teaching sciences (Federal Republic of Nigeria, 2004). Researchers have found in different occasions the two approaches effective in tackling instructional problems (Anaekwe 2007, Igbo, 2004 and Okebukola, 2008). Okebukola (2008) found cooperative learning effective in tackling the problem of large class in Biology. Anaekwe (2007) investigated the effects of students' interaction patterns on cognitive achievement, retention and interest in Basic technology. The investigation found cooperative learning efficacious. Igbo (2009) found peer-teaching effective in improving the learning disabled achievement in mathematics. There is therefore the need to explore the effects of the two child-centred instructional approaches: cooperative learning and peer-teaching on students' achievement and interest in some perceived difficult Basic Technology concepts so as to probably improve students' performance in Basic technology and avert the problems of poor achievement and interest in Secondary Schools Basic Technology.

Interest, an aspect of affective domain is a construct that has to do with ones readiness to like or dislike something. It could be aroused in individual by activity that tends to satisfy the individuals needs (Geoscience, 2007).

Since the conventional teaching methods persistently used by basic technology teachers (Amaefule, 2010; Ezeliora, 20011) cannot permeate the difficult basic technology concepts which manifests in perennial poor students' achievement, the researchers therefore deemed it necessary to study the effects of cooperative learning and peer-teaching on students' achievement and interest in some basic technology. These instructional strategies have been found effective in overcoming other instructional problems such as large class size (Okebukola & Oguniyi, (2012). It might therefore not be out of place to investigate the effects of these strategies on students' achievement and interest in some basic technology an attempt to improve on student's achievement in basic technology.

**Research Questions**

1. What are the mean achievement scores of students taught basic technology using cooperative learning, peer- teaching and conventional teaching method?
2. What are the mean interest scores of students taught some basic technology concepts using cooperative learning, peer- teaching and conventional (lecture) teaching method?

**Hypothesis**

1. There is no significant difference in the mean achievement scores of students taught basic technology using cooperative learning, peer- teaching and conventional teaching method.

**Methodology**

The population of the study comprised of Junior Secondary School (JS II) students of basic technology in some secondary schools in Minna, Niger State. The population of JS II students in 2011/2012 academic sessions used who offered basic technology was 110. This was obtained from Schools that have relevant practical training materials in Minna. The Basic Technology Achievement Test (BTAT) and Basic Technology Interest Inventory (BTII) developed by the researchers were used for data collection.

The instrument used for the study was validated by two teachers of Secondary Schools in Minna who had a Second degree in the relevant subjects and one Lecturer in the Department of Industrial and Technology Education, Federal University of Technology, Minna. The reliability of the instrument was calculated using Split-half reliability Spearman Brown formula and the result obtained was 0.701.

The lesson plans used were three in number for each of the three groups, namely cooperative learning group, The peer teaching group and the conventional group. Pre-tests using the validated BTAT and BTII were first administered on the subjects by the teachers and the result carefully recorded before the treatment session, which lasted for three weeks. After the treatment, post-tests were administered on the subjects by the researchers using the same BTAT and BTII as in the pre-test. There are 15 items in each of the instrument used. The research questions were answered using mean scores and standard deviations of scores. The hypothesis was tested with Analysis of Covariance (ANCOVA), at 0.05 alpha levels of significance.

**Results**

**Research Question 1**

What are the mean achievement scores of students taught basic technology using cooperative learning, peer- teaching and conventional teaching method?

This question was answered by computing mean achievement scores, and standard deviations of students', scores of students taught using cooperative learning, peer-teaching and conventional teaching method as shown in Table 1.

**Table 1**

**Mean achievement scores and standard deviations of students in pre-tests and post-tests**

| Treatment | Pre-test | | Post test | | |
|---|---|---|---|---|---|
| | X | SD | X | SD | Mean Gain Score |
| Peer – Teaching | 23.00 | 11.33 | 55.62 | 14.99 | 32.62 |
| Cooperative Learning | 30.44 | 10.80 | 62.28 | 17.05 | 31.84 |
| Conventional (Lecture) Teaching | 22.98 | 4.70 | 44.94 | 9.23 | 21.96 |

Table 1 show that students taught using cooperative learning had the highest mean achievement score of 30.44 and SD of 10.80 in the pre-test. Students taught using peer-teaching had mean achievement score of 23.00 and SD of 11.33in the pre-test, while those, taught using the conventional teaching method had the least mean score of 22.98 and SD of 4.7 in the pre-test. In the post test students taught using cooperative learning had the highest mean score of 62.28 and SD of 17.05 followed by students taught using peer – teaching with mean score of 55.62 and SD of 14.99 and Students taught using conventional teaching method had the least mean score of 44.94 and SD of 9.23.

The students gain mean score for the peer - teaching group was 32.62. The students mean gain scores for the cooperative learning and lecture method groups were 31.84 and 21.96 respectively. It implies that peer-teaching approach is the most effective in teaching basic technology.

Table 1 above also showed that in the pre-test, scores in peer – teaching group deviated highest from the mean score with the standard deviation of 11.33. Cooperative learning group with standard deviation of 10.80 followed it. Conventional method group deviated least from the mean score with the standard deviation of 4.70. Whereas in the post – test, scores in cooperative learning group deviated highest from the mean score with standard deviation of 17.05 followed by the peer teaching group with standard deviation of 14.99. The lecture method group deviated least with standard deviation of 9.23. The high mean achievement scores in the post test for the cooperative learning and peer–teaching suggests that the two strategies may be effective in learning basic technology.

**Research Question 2**
What are the mean interest scores of students taught basic technology using cooperative learning, peer – teaching and conventional teaching method?

This question was answered by computation of the mean interest scores and standard deviations of scores of students taught using cooperative learning, peer – teaching and conventional teaching method as shown in table 2.

*Table 2:*
**Mean interest scores and standard deviations of students in pre-tests and post -tests due to treatments.**

| Treatment Groups | Pre-test | | Post-test | | Mean Gain Score |
|---|---|---|---|---|---|
| | X | SD | X | SD | |
| Peer Teaching | 37.80 | 9.274 | 64.14 | 10.73 | 26.34 |
| Cooperative Learning | 38.61 | 9.97 | 71.44 | 11.05 | 32.83 |
| Conventional(Lecture) Teaching | 42.36 | 12.86 | 49.83 | 11.31 | 7.48 |

Table 2 showed that students taught using conventional teaching method had the highest mean interest score of 42.37 and Sd of 12.86 in the pre-test. Students taught using cooperative learning had a mean interest score of 38.61 and SD of 9.97, while those students taught using peer teaching had the least mean interest score of 37.80 and SD of 9.27 in the pre-test. There was the highest deviation of scores from the mean interest score in the conventional method group followed by the cooperative learning group and the least deviation was in the peer-teaching group.

In the post- test, students taught using cooperative learning had the highest mean interest score of 71.44 and SD of 11.05, students taught using peer-teaching had a mean interest score of 64.14 and SD of 10.73, while Students taught using conventional teaching method had the least mean interest score of 49.84 and SD of 11.31.

The students' gain mean scores were 32.83, 26.34 and 7.48 for the cooperative learning group, peer – teaching group and lecture method group respectively. The high mean interest score, for the cooperative learning and peer – teaching is suggestive of the fact that the two strategies were effective in developing students' interest in learning basic technology. The cooperative learning is more effective than the peer-teaching in developing students' interest in learning basic technology. This is because in the post-test, the mean gain interest score for the cooperative learning was higher than that of the peer-teaching as seen in table 2.

**Hypothesis**
There is no significant difference in the mean achievement scores of students taught basic technology using cooperative learning, peer- teaching and conventional teaching method.

**Table 3:**
**Analysis of covariance of students' post Achievement due to Treatment.**

| Source | Type III sum of squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Corrected Model | 19155.051[a] | 6 | 3192.509 | 17.332 | .000 |
| Intercept | 63480.618 | 1 | 63480.618 | 344.634 | .000 |
| Pre achievement | 4170.798 | 1 | 4170.798 | 22.643 | .000 |
| Treatments | 9631.422 | 2 | 4815.711 | 26.144 | .000 |
| Error | 50838.475 | 100 | 184.197 | | |
| Total | 902148.000 | 110 | | | |
| Corrected Total | 69993.527 | 109 | | | |

a. R Squared = .274 (Adjusted R Squared = .258)

Table 3 shows that the difference in mean achievement scores between the groups taught using the different teaching strategies in the covariates is significant since the worked F ratio of 26.144 is significant at P< 0.000. The difference in the mean achievement scores between the treatment groups is therefore significant at P< 0.05. Therefore it can be concluded that the hypothesis is rejected. The difference in the mean achievement scores of students taught basic technology using cooperative learning, peer-teaching and conventional teaching method is significant and not by chance.

**Discussion of Findings**

Peer-teaching yielded a significant difference on students' achievement in some difficult basic Technology concepts than conventional (lecture) teaching method. The hypothesis indicates that cooperative learning yielded a significant difference on students' achievement in some difficult basic Technology Concepts than conventional (lecture) teaching. The implication is that either of the cooperative learning or peer – teaching (both being child-centred) strategies could be applied to achieve goals of basic Technology education in some difficult basic Technology Concepts. This is in line with Nnaka (2006) who calls for a shift from the conventional methods of teaching to innovative strategies in teaching science, Technology and Mathematics for effectiveness. The two strategies are learner-centred and more active than the conventional (lecture) teaching method. Students can learn the difficult basic Technology concepts when they are actively involved (Conway, 1999). The result is also in line with the National Policy on Education which stresses that the teaching of Basic Technology should be centred on the learner for maximum self development and self fulfilment (FRN, 2004). The practical nature of most difficult Basic Technology concepts demands active participation of the learner which the conventional (lecture) teaching method does not usually provide. The conventional (lecture) teaching encourages rote learning (Amaefule, 1999) which is not suitable for learning the abstract difficult Basic Technology concepts. Therefore the abstract nature of the most concepts could be minimized in the process of learning those concepts by using more pragmatic and effective teaching strategies such as the cooperative learning and peer- teaching.

Peer-teaching comparatively enhanced students' interest in learning some difficult Basic Technology concepts than the conventional (lecture) teaching method. The results also is indicative of the fact that the cooperative learning was comparatively more effective in enhancing students' interest in learning some difficult Basic Technology concept, than both the peer teaching and the lecture method.

The active nature of cooperative Learning and peer- teaching impressed the students. They took interest in the discussion, analysis and problem solving in Basic Technology concepts. This participation increased their interest in Basic Technology despite the difficult nature of the concepts.

Taking interest in basic Technology is a positive first step towards better performance in achievement tests. This idea agrees with Ugwu (2013) who posits that capturing students' interest in Basic Technology is a necessary precondition for improved students' achievement in Basic Technology. This study has proved that the Learner Centeredness of Cooperative Learning and Peer- teaching can greatly improve the students' interest in learning the Basic Technology concepts which in turn will enhance students' achievement in Basic Technology.

The conventional teaching method has been described as uninteresting to the students and ineffective due to its teacher-centeredness and relative lack of activity on the part of the students. Teachers' extensive dependence upon conventional teaching in teaching the basic Technology concepts does not enhance students' interest in learning difficult basic technology concepts. This in consonance with Ezeliora (2003) who maintains that students' poor performance and lack of interest in Basic Technology teachers' excessive use of the expository method of instruction.

On the other hand, cooperative learning is significantly more interest enhancing in students in learning difficult Basic Technology concepts than the peer-teaching. This confirms that the more child-centred a teaching approach, the more efficacious it is in realizing the educational objectives. The cooperative learning involved fairly equal contributions by students in the task of learning the Basic Technology concepts while in peer-teaching the peer students depended on the peer –teacher's contribution. Therefore the cooperative learning is more efficacious in enhancing students' interest and performance.

**Conclusion**

Both cooperative learning and peer teaching had been proved efficacious in enhancing students' achievement in basic technology but the cooperative learning yielded a better result. This means that in an effort to achieve set objectives of basic technology education in Junior Secondary Schools Basic Technology should be taught using more of the cooperative learning than peer-teaching. The conventional (lecture) teaching method had been proved to be ineffective in enhancing students' achievement in Basic Technology. Therefore the set objectives of basic technology education will be difficult to achieve using the conventional (lecture) teaching method.

With regard to interest both cooperative learning and peer-teaching had been proved work to be efficacious in enhancing and maintaining the students' interest in learning basic technology. However, the cooperative learning yielded a better significant result. Therefore to capture and sustain students' interest in basic technology, more of cooperative learning should be applied. On the other hand, the conventional (lecture) teaching method was found to be ineffective in enhancing and maintaining students' interest in basic technology.

The use of cooperative learning and peer-teaching should be recommended in the Basic Technology curriculum since both are efficacious in their effects. Teachers should therefore use either of the cooperative learning or peer-teaching in teaching basic technology as this will help to address the perennial poor performance of students in Junior Secondary School Basic Technology. However, cooperative learning should be more frequently used as it captures and sustains the interest of students in learning basic technology more than the peer-teaching.

**Recommendations**

1. Cooperative learning and peer – teaching should be emphasized and incorporated into the basic technology – teacher education curriculum in tertiary institutions of learning.
2. Stakeholders in Technical Education like Ministries of Education, State Schools Management Boards, Post Primary School Services Commission, Education Commissions, Science and Technical School Boards should organize seminars, workshops and conferences where teachers in the field of Technology would be opportune to learn how to make the best use of cooperative learning and peer-teaching in teaching basic technology.
3. Professional Associations like the National Association of Teachers Technology (NATT) should popularize the effective use of cooperative learning and peer-teaching in teaching Technical Education through seminars, work-shops, conferences and publications.
4. The use of cooperative learning and peer-teaching should be recommended in schools and Technical Colleges curriculum for teaching the difficult concepts. The effective use of the two teaching approaches should be reflected in the curriculum materials like the text books and other instructional materials.
5. Cooperative learning should be frequently applied in teaching Basic Technology concepts to enhance students' interest. This is necessary as the goals of Basic Technology education in the Junior Secondary Schools cannot be realized if the interest of the students is not assured through appropriate instructional approach.

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