Comparative Effect of Demonstration and Cooperative Learning Strategy on Students Achievement in Electricity Transmission in Basic Technology

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ABSTRACT
The study focused on the Comparative Effect of Demonstration and Cooperative Learning Strategy on Students Achievement in Electricity Transmission System in Basic Technology. The design of the study was the Randomized Post-Test Only Control Group Experimental Design. One research question was posed and one null hypothesis tested in the study. The sample of the study consisted of 24 Junior Secondary School Students Two (JSS2) studying Basic Technology in FAMVAR International Secondary School, Port Harcourt, Rivers State. The researchers developed a test instrument titled “Electricity Transmission System Achievement Test” (ETSAT) which was face and content validity by two subject teachers in Basic Technology. Kuder-Richardson Formula 21 was used to obtain the reliability coefficient of the instrument to be 0.82. Mean and standard deviation were used to analyze the research question while Pearson Product Moment Correlation Coefficient and t-test were used to test the hypothesis. The findings from the research question revealed that experimental group taught Cooperative Learning Strategy performed better than the control group taught with Demonstration learning Strategy in Electricity Transmission System in Basic Technology. Results of the test of the hypothesis indicated that the experimental group taught Cooperative Learning strategy performs better than the control group taught with demonstrational teaching Strategy. Finally, it was recommended among others that teachers should apply Cooperative Learning Strategy in handling some practical based topics in Basic Technology.

Keywords: Demonstration Method, Skill Cooperative Learning Strategy, Electricity Transmission System, Basic Technology.

INTRODUCTION
Electricity transmission simply involves the movement of electricity from the power generating station to our homes (Elekwa, Bamiro, Oluyide, Ladoye, Nurudeen & Akuru, 2009). Electrical power is said to be transmitted when it is conveyed from its source of generation to distances far away or near sending end. Electric power transmission is also viewed as the bulk movement of electric energy from a generating site, such as power plant; to an electric substation (FEMP, 2008). The interconnected lines which facilitate this movement are known as a transmission network. The combined transmission and distribution network is known as power grid. Electricity is transmitted at high voltage to reduce the energy loss which occurs in long distance transmission and power is usually transmitted through overhead power lines. Electricity transmission system is taught in Basic Technology at junior secondary education level. The topic exposes students to transmission of electricity at low and high frequencies, distribution, utilization and materials as well as equipment such as transformers, cables, insulators, fuses and so on (Elekwa et al, 2009).

Basic Technology, which was formerly termed Introductory Technology, is currently taught at the primary and junior secondary education levels of the Nigerian education system (Federal Republic of Nigeria, 2013). The Federal Ministry of Education, Science and Technology (1985) and the
Comparative Education Study and Adaptation Centre (CESAC, 1985) stated that the objectives of the Basic technology subject include to; (i) provide pre-vocational orientation for further training in technology; (ii) provide basic technology literacy for everyday living; and (iii) Stimulate creativity. Basic Technology therefore is a preparatory core subject of engineering, vocational and technology education. At the Junior Secondary Education level, Basic Technology is aimed at introducing the basis and rudiments of technology in the world of work, and increasing the students’ awareness and enthusiasm in the field of technology and engineering in order to make appropriate choices in related area of study for further education (Omomnwan, & Chukwuedo, 2014). According to Uwameiye and Ojikutu (2008), Basic Technology is offered at the JSS as a key subject like Mathematics and Science in order to reduce ignorance about technology and lay solid foundation for true national development. Thus, the teaching and learning of Basic Technology to students is targeted towards inculcating technological literacy that is basic in understanding modern world advancement. As an engineering or technology based subject, Basic Technology is taught both in the classroom setting and in the workshop (laboratory). It therefore involves the teaching of theoretical and practical skills. In other words, students are exposed to affective, cognitive and psychomotor domain. Different approaches have been adopted in teaching basic technology. Some of such teaching strategies are lecture, demonstration, cooperative learning Strategy, experimental, project-based and so on. In this study, demonstration method and cooperative learning strategy are being considered.

Demonstration method is a traditional classroom strategy commonly used in teaching technology based subjects in schools. Umar (2013) stated that Demonstration Learning strategy is based on the following principles: (1) Learning by doing maxim is followed; (2) Skills can be developed by limitation; (3) The perception helps in imitation. Umar further stated some advantages of the Demonstration Learning strategy to include; (a) It helps in involving various senses to make learning permanent. (b) Though, teacher behavior is autocratic, he invites the cooperation of pupils in teaching learning process. (c) It develops interest in the learners and motivates them for their active participation. (d) It helps in achieving psychomotor objectives. (e) Any simple or complex skill becomes easy to understand. Some disadvantages of Demonstration Learning strategy as also stated by Umar (2013) include: (i) It can be used only for skills subjects; (ii) Only the attention of the learners is invited towards the activity demonstrated. They are not free to discuss about it; (iii) Due to poor economic conditions of the government schools, there is scarcity of audio-visual aids and equipment and the teachers are not so creative to produce handmade models for demonstration; (iv) There is a general lack of sincerity and diligence among teachers who wish to complete the syllabus or syllabi at the earliest without putting sincere efforts.

On the other hand, Cooperative Learning strategy is a form of active learning activity which allows students to develop their own learning abilities while the teacher acts as a guide or facilitator (Duplass, 2006). In collaborative learning, students take responsibility for their learning which leads to better performance (Rester & Laferriere, 2007). Cooperative learning has the potential to capitalize on the developmental characteristics of adolescents in order to harness their peer orientation, enthusiasm, activity and craving for independence within a safe structure. Michael (2006) views cooperative learning strategy as learning situation where a small dedicated group of students learn together and take advantage of each other’s expertise to achieve a common goal.

Foyle & Lyman, (2008) identified the basic steps involved in successful implementation of cooperative learning activities as follows:

1. The content to be taught is identified and criteria for mastering are determined by the teacher.
2. The most useful cooperative learning technique is identified and the group size is determined by the teacher.
3. Students are assigned to groups
4. The classroom is arranged to facilitate group interaction
5. Group processes are taught or reviewed as needed to assure that the groups run productively.
6. The timeline for activities is made clear to students.
7. The teacher presents initial material as appropriate, using whatever technique he chooses
8. The teacher monitors students interaction in the groups and provides assistance and clarifications as needed
9. Student outcomes are evaluated
10. Groups are rewarded for success.
In a nutshell, cooperative learning promotes positive learning attitude among students (Johnson & Johnson, 2008; Ifamuyiwa & Akinsola, 2008). However this study is an attempt to compare the demonstration and cooperative learning strategy on students’ achievement in electricity transmission system in Basic Technology offered in junior secondary education level in Nigeria’s secondary education.

**Statement of Problem**
Basic technology is a key pre vocational subject that is needed in the study of vocational and technological subjects at senior secondary school level. For effective teaching of the subject to take place in the classroom, it is expected that the teacher should be armed with the necessary knowledge and skill to enable students perform well in examination. Basic technology as a practice-oriented subject is included so as to developed practical and applied skills in the learners. A lot of factors may contribute to students’ poor performance in Basic Technology. An examination of past performance of student by junior secondary school indicate that in 2005, only 27.53 percent passed basic technology and some core subject while 15.56 percent passed in 2006 (WAEC, 2006). In 2007 25.54 percent sealed the line with the worst performance of 13.76 percent recorded in 2008 (My project research, 2016). There was slight improvement in 2009 when 25.99 percent passed the examination, a figure that went down in 2010 to 20.04 percent (Olorundare, 2010). Furthermore, statistics released by the West African Examinations Council (2010) revealed that 24.94 percent obtained credit in Basic Technology and two science subjects representing 337,071 candidates of 1,351,557 candidate registered for the exam in 2010 May/June which is 75.06 percent failure rate. Students’ poor performance at the junior secondary level, show that all is not well with the education received at basic education level. The problem of the study is that students are not performing well in Basic Technology as revealed in the failure rate and lack of qualified teachers shown above. There is therefore a need to compare the demonstration teaching method and cooperative learning strategy to see if students’ performance can be improved with the application of one of them in instruction.

**Purpose of the Study**
The study focused on comparative effect of demonstration and cooperative learning strategy on students’ achievement in electricity transmission system in Basic Technology. The study specifically sought to find out the difference in the post-test mean achievement of student taught with Demonstration teaching strategy and those taught with Cooperative Learning strategy in electricity transmission system in Basic Technology

**Research Question**
The researchers developed the research question below to guide the study:
What is the difference in the post-test mean achievement of student taught Demonstration teaching Strategy and those taught with Cooperative Learning strategy in electricity transmission system in Basic Technology?

**Hypothesis**
In this study, the following null hypothesis was tested at 0.05 level of significance:
There is no significant difference in the post-test mean achievement of student taught Demonstration teaching Strategy and those taught with Cooperative Learning strategy in electricity transmission system in Basic Technology.

**MATERIALS AND METHODS**
The researchers adopted a Two Group Post-Test Only Control Group Experimental Design. Students were assigned to two groups namely the experimental group taught with Cooperative Learning strategy in electricity transmission system in Basic Technology and the control group taught with Demonstration teaching Strategy. Treatment was administered to both experimental and control group.

**Population of the Study**
The population consists of total 24 students in JSS 2 class used for the treatment in FAMVAR International Secondary School. The school was chosen for this study because it has qualified Basic Technology teachers and well equipped Basic Technology laboratory. Junior Secondary School 200 level students (JSS 2) were selected because the curriculum of Basic Technology has a topic on Electricity Transmission System.
Sample of the Study
The entire population of 24 students was used in the study. The students were randomly assigned to group M (experimental group) and group N (control group), with each group consisting of 12 students each. Group M was taught with Cooperative Based Learning strategy while Group N was taught with Demonstration teaching Strategy in electricity transmission system in Basic Technology.

Instrument for Data Collection
The researchers developed a test instrument titled Electricity Transmission System Test (ETST). The instrument consisted of 10 test items with 4 response options (i.e. a, b, c & d) which was administered to both experimental and control group. The test instrument covered areas such as components of transmission system, basic principle of electricity distribution and utilization of electricity, under the topic: Electricity Transmission System.

Validity of the Instrument
Face and content validity was done by two subject teachers in Basic Technology in New Covenant Secondary School, Port Harcourt. The experts checked if the questions were in line with the JSS2 Education Curriculum in Basic Technology. Their recommendations were considered before the final copy of the instrument was produced and used for the study.

Reliability of the Instrument
Kuder-Richardson Formula 21 was used to obtain the reliability of the instrument. The researchers subjected 5 students in New Covenant Secondary School, Port Harcourt and administered ETST items. The test scores were collected and calculated using Kuder-Richardson Formula 21. From the test scores obtained, the reliability was calculated to be 0.78 which was considered adequate for the study.

Procedure for Treatment of Experimental and Control Group
The researchers observed the following procedures in carrying out the treatment:

1. The researchers briefed a regular Basic Technology teacher on how to carry out the treatment for both experimental and control group.
2. The teacher assigned the students randomly to experimental and control group.
3. The teacher arranged the experimental group M in group and assigned an activity in the area of components of transmission, basic principle of electricity distribution and so on. Pictures, charts, videos were displayed for students to interact. The students made sketches, share ideas, ask questions within themselves and make little presentations on their experiences.
4. The teacher in between interaction section assists the students in achieving the purpose of the lesson.
5. The teacher allows the students to explore topic in Electricity Transmission System in Basic Technology for two double periods using the regular school time table. Also the teacher in another double period schedule taught the control group in Electricity Transmission System using Demonstration teaching Strategy.
6. The teacher alongside with students demonstrated with the aid of pictures and chart components of transmission system, basic principle of electricity distribution and utilization of electricity for double period of 90minutes.
7. At the end of the treatment given to both experimental and control group, a post – test was administered to the students. The post – test lasted for 1 hour.
8. The post-test scores were collected and recorded.

Method of Data Analysis
Mean and standard deviation were used to analyze the research question while Pearson Product Moment Correlation coefficient (PPMC) was used to test the only hypothesis.
RESULTS
Research Question 1: What is the difference in the post-test mean achievement of student taught with Demonstration teaching strategy and those taught with Cooperative Learning strategy in electricity transmission system in Basic Technology?

Table 1: Post-Test Mean Achievement of Students Taught with Demonstration and Cooperative Learning Strategy in Electricity Transmission System

<table>
<thead>
<tr>
<th>Groups</th>
<th>Teaching Method</th>
<th>Number of Subjects</th>
<th>Standard Deviation</th>
<th>Mean</th>
<th>Difference in Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental group</td>
<td>Cooperative Learning</td>
<td>12</td>
<td>14.50</td>
<td>56.70</td>
<td>5.0</td>
</tr>
<tr>
<td>Control group (N)</td>
<td>Demonstration Teaching</td>
<td>12</td>
<td>15.70</td>
<td>51.70</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>24</td>
<td>30.20</td>
<td>108.40</td>
<td>5.0</td>
</tr>
</tbody>
</table>

The mean and standard deviation value of experimental group taught Cooperative Learning strategy in electricity transmission system in Basic Technology has a mean and standard deviation score of 56.7 and 14.50 respectively. On the other hand, the mean and standard deviation score of students taught demonstration teaching Strategy is 51.7 and 15.70 respectively. The difference in mean achievement of both experimental and control group was calculated to be 5.0. This indicates that the experimental group taught Cooperative Learning strategy performs better than the control group taught with demonstration teaching Strategy in Electricity Transmission System in Basic Technology.

Null Hypothesis
There is no significant difference in the post-test mean achievement of student taught with Demonstration teaching strategy and those taught with Cooperative Learning strategy in electricity transmission system in Basic Technology.

Table 2: Analysis of Mean Achievement of Students using Demonstration and Cooperative Learning Strategy in Electricity Transmission System in Basic Technology

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>N</th>
<th>(\sum XY)</th>
<th>df</th>
<th>r</th>
<th>(t)-cal.</th>
<th>(t)-tab</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental group</td>
<td>56.7</td>
<td>14.5</td>
<td>12</td>
<td>37,215</td>
<td></td>
<td>0.83</td>
<td>4.71</td>
<td>2.074</td>
<td>Reject</td>
</tr>
<tr>
<td>Control group (M)</td>
<td>51.7</td>
<td>15.7</td>
<td>12</td>
<td>37,215</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>108.4</td>
<td>30.2</td>
<td></td>
<td>37,215</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Degree of freedom = \(N_1+ N_2-2= 24-2=22\).
Using Pearson Product Moment Correlation Coefficient, r value was calculated to be = 0.83. Where df=degree of freedom= 22

\[ T = 0.83 \sqrt{((12-2) + (1 - 0.83^2))} \]
\[ T=4.71 \]

Since computed \(t\)- value of 4.71 is greater than \(t\)-critical value of 2.074 at 0.05 level of significance, we therefore reject the null hypothesis. This show that there is significant difference in the post-test mean achievement of student taught Demonstration teaching strategy and those taught with Cooperative Learning strategy in electricity transmission system in Basic Technology.

DISCUSSION
The research work was based on Comparative Effect of Demonstration and Cooperative Learning Strategy on Students Achievement in Electricity Transmission System in Basic Technology. Findings from the research question revealed that experimental group taught Cooperative Learning strategy performed better than the control group taught with demonstrational teaching Strategy in Electricity Transmission System in Basic Technology with a mean difference of 5.0. This may be as a result of the effect of the group cooperation that exists among the students. This is in line with the findings of Johnson and Johnson (2008) and Ajaja & Eravwoke (2010) that students who fully participate in
group activities, exhibit collaborative behaviors, provide constructive feedback, and cooperate with their groups and have higher likelihood of receiving higher test scores. Data analysis from the hypothesis tested showed that the computed t-value of 4.71 is greater than the critical t-value which is 2.074 at 0.05 level of significance. This indicates that there is significant difference in the post-test mean achievement of student taught Demonstration teaching method and those taught with Cooperative Learning strategy in electricity transmission system in Basic Technology. The significant difference shows a gap between the two methods used in teaching. This implies that cooperative teaching strategy is significantly better than demonstration teaching method when applied in teaching electricity transmission system in Basic Technology. The finding is consistent with those of Header (2003) and Aziz and Hossain (2010) who stated that students experience positive academic gain when learning with cooperative learning strategy.

CONCLUSION
The present study helped to advance understanding on the practical contribution of cooperative learning as it positively affected students’ achievement in Basic Technology. The result of the study showed significant difference in Basic Technology achievement between experimental and control groups. The findings obtained from the study showed that experimental group taught Cooperative Learning strategy performs better than the control group taught with demonstrational teaching Strategy in Electricity Transmission System in Basic Technology. It could be deduced from the finding of this study that students seem to prefer learning the elements of Basic Technology by sharing knowledge and feeling contented when they can function effectively in the group work. Thus, based on the findings of the study, the researchers came to the conclusion that cooperative learning principles are more effective in promoting students’ achievement in Basic Technology.

RECOMMENDATIONS
The following recommendations were made:
1. Teachers should apply Cooperative Learning strategy in handling electricity transmission system and other practical based topics in Basic Technology.
2. Other student-centered teaching methods should be applied in teaching different topics in Basic Technology.
3. Teachers should encourage social interactions among students in order to boost their academic achievement in schools.

REFERENCES


