EFFICACY OF PEER GROUP TEACHING APPROACH ON ACADEMIC PERFORMANCE OF PRE SERVICE PHYSICS STUDENTS IN COLLEGES OF EDUCATION, NIGERIA

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ABSTRACT
The aim of the study was to determine the efficacy of peer group teaching approach on academic achievement of pre-service teachers when taught Mechanics in Physics. Two hundred and fifty-one students participated in the study. Research design was quasi-experimental with pre-test post-test setting. Mechanics Academic Achievement Test (MAAT) validated by three experts with a reliability coefficient of $r = 0.79$ and peer group structured lesson plans were the instruments used. Two research questions and two null hypotheses guided the study. The statistic used in testing the hypotheses was a t-test. Result showed that peer group teaching approach was effective in enhancing pre-service teachers’ academic achievement and the approach was not gender friendly. Adequate use and further studies on the approach on other topics and academic levels was recommended.

KEYWORDS: Efficacy, Peer- group teaching approach, Academic performance, Pre service teachers, Mechanics, Gender

INTRODUCTION

Physics is an exciting intellectual subject that inspires young people and expands the frontiers of knowledge about nature. It generates fundamental knowledge needed for future technological advances that will continue to drive the economic engines of the world. Physics is an important element in the education of chemists, engineers and computer scientists, as well as practitioners of the other physical and biomedical sciences (Eurling, 2019).

Physics extends and enhances understanding of other disciplines and areas such as the earth, agricultural, chemical, biological, and environmental sciences, plus astrophysics and cosmology - subjects of substantial importance to all peoples of the world. Physics improves quality of life by providing the basic understanding necessary for developing new instrumentation and techniques for medical applications, such as computer tomography, magnetic resonance imaging, positron emission tomography, ultrasonic imaging, and laser surgery.

Due to the importance of Physics, it is one of the subjects studied by pre-service teachers in colleges of education and universities in preparation for dissemination of what has
been learnt to younger students who would go into Physics related career courses in life. Colleges of education are teacher training institutions saddled with the responsibility of training those who will be teaching at the basic science level of education in Nigeria. The pre-service teachers are expected to learn the subject for their cognitive knowledge and skills they would require to serve effectively as teachers. Pre-service teachers also undergo some pedagogical skills acquisition training needed for teaching. However, recent studies of performance of students in Physics in colleges of education in Nigeria has not been satisfactory (Aina, 2014).

The unsatisfactory performance has been associated with the lecture teaching method mostly employed by lecturers in colleges of education in Nigeria. According to learning pyramid developed by National Training Laboratories NTL (1954), lecture method of teaching enables the learner retain only about 5% of what was learnt. According to the learning pyramid, students retain 50% of what they learn using group discussion, 70% when they practice by doing and 90% when they practice teaching others. From the summary of the learning pyramid, participatory teaching approaches appear to be more effective than passive teaching methods. This effective option of participatory approach made this researcher to explore the efficacy of peer group teaching approach on students’ academic performance in Mechanics as one of the topics in Physics that has concepts and skills required in learning almost all topics in Physics. Mechanics was also chosen because it has been identified as one of the difficult topics in Nigerian secondary schools (Okpala & Onocha, 1988; Eurling, 2019).

Peer group teaching is an educational practice in which students interact with other students to attain educational goals. Peer group teaching occurs when students by design teach other students and learn from each other in both formal and informal ways. Peer teaching is built on the belief that to teach is to learn twice (Fisher & Frey, 2019). Peer learning is encouraged by cooperation, communication, feedback, teaching and learning.

THE PROBLEM

The general performance of students learning physics in colleges of education in Nigeria was observed to be unsatisfactory by Aina (2014). Students’ poor performance has been associated with teaching methods (Wanbugu, Ngesa & Cheplogoi, 2014), due to subject area of specialization or inappropriate subject combinations (Aina, 2015). However, teaching methodology was found to have the highest influence on students’ performance. Unsatisfactory performance is not befitting to the statute of prospective physics teachers that are needed for scientific and technological development of Nigeria. It was also reported by Aina (2015), and Aghruwe and Agregbe (2017) that most teachers of science use lecture methods for their teaching which was diagnosed to provide about 5% of what is learnt as provided in Learning
Pyramid. It was earlier observed by Tulborel (2012) that teaching strategies employed by teachers have positive effect on students’ learning outcomes.

Several innovative teaching strategies have been prepared and practiced to serve as a panacea for effective teaching and learning of science in Nigeria. Some of the strategies included inductive approaches, deductive approaches and Socratic approaches (Udu, 2018). However most of the approaches adopt surface learning which does not encourage effective performance by students. Surface learning according to Beauseart, Segers and Wiltink (2013), refers to learning which does not make students seek further understanding of learning materials and only encourages memorization and reproduction. Further research on other effective teaching strategies with an inclination towards learner centered participatory approach may yield more effective strategies for teaching science and better academic performances of students in the sciences.

In the Learning Pyramid too, it was highlighted that participatory teaching approaches provide an opportunity for retaining almost 90% of what is taught to students (Letrud, Hernes, 2018). Therefore, the worry on the performance of prospective Physics teachers and the need to explore more effective teaching strategies for teacher skill development justify the need for testing the efficiency of peer group teaching approach on mechanics course among pre-service teachers in colleges of education in Nigeria.

RESEARCH QUESTIONS

Based on the problem identified, two research questions were raised to guide this research. They are:

1. What are the mean academic performance scores of students taught Physics using peer teaching approach and those taught using lecture method?
2. What is the difference in the mean academic performance scores of male and female students taught physics using peer-teaching approach?

NULL HYPOTHESES

The following null hypotheses were raised and tested at 5% significance level.

\( H_01 \) There is no significant difference between the mean academic performance scores of students taught physics using peer-group teaching approach and those taught using lecture methods.

\( H_02 \) There is no significant difference between the academic performance scores of male and female students taught Physics using peer-group teaching approach.

METHODOLOGY

All Nigeria Certificate of Education (NCE) Physics students in colleges of education in Nigeria are the population of the study. With 82 colleges of education and an average of fifty
Physics students per college, the population is estimated at four thousand, one hundred (4,100) students (Bajeh, 2018). The sample is all Physics students at the Federal College of Education (FCE) Zaria, Nigeria. The sample comprises two hundred and fifty-one (251) NCE Physics students in regular and part-time programmes of the Federal College Education Zaria. Intact class of 97 and 123 NCE Physics students in part-time and regular physics programme were selected to serve as experimental and control groups for the study. Sample of 220 agrees with the minimum of 30 study subjects for an experimental study to be reliable as suggested by Tuckman (1975). FCE Zaria was chosen because it has students from all local governments of Nigeria (Abdullahi, 2018) which could make findings of the study adequately representative and inclusive.

The research design for the study was quasi experimental design with pre-test, post-test setting. The instrument used was Mechanics Academic Performance Test (MAPT) with a reliability of 0.76. The topic of Mechanics was chosen because it is one of the ten most difficult topics in Physics (Eurling, 2018). MAPT was designed by the researcher and comprises 40 items in multiple-choice form. Peer group tutoring strategy flow chart was used for administration of treatment to the experimental group.

For treatment purpose, ten peer tutoring class lesson plans were made. Students in the experimental group were given an orientation on some required skills training for peer teaching. Students in the experimental group were divided into groups of five, each group was given a topic to study, interact with and present to the whole class. The treatment lasted for ten weeks and t-test statistic was used in the analysis of data collected. The control group was taught similar subject content using traditional lecture method in 10 consecutive interactions with a research assistant.

RESULTS

Research Question One: What are the mean academic performance scores of students taught Physics using peer teaching approach and these taught using lecture method?

Table 1: Mean and Standard Deviation Scores of Students Taught Physics Using Peer-Teaching Approach and Those Taught Using Lecture Method

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Sd</th>
<th>Men difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>57</td>
<td>57.92</td>
<td>15.31</td>
<td>10.32</td>
</tr>
<tr>
<td>Control</td>
<td>89</td>
<td>47.61</td>
<td>13.63</td>
<td></td>
</tr>
</tbody>
</table>

Table 1 shows the mean academic achievement scores of experimental and control groups to be 57.92 and 47.61 with standard deviation of 15.31 and 13.63 respectively. The mean difference is 10.32 indicating a superiority of the experimental group over the control
group in terms of performance. To determine whether the difference was significant null hypothesis one was tested using t-test.

**Null hypothesis One:** There is no significant difference between academic performance mean scores of students’ taught Physics using peer-teaching strategy and those taught using lecture method.

**Table 2: t-test Analysis of Post-Test Mean Scores of Experimental and Control Groups**

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Sd</th>
<th>Df</th>
<th>t_cal</th>
<th>P_value</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>57</td>
<td>57.92</td>
<td>15.31</td>
<td>144</td>
<td>0.19</td>
<td>0.03</td>
<td>Significant</td>
</tr>
<tr>
<td>Control</td>
<td>89</td>
<td>47.61</td>
<td>13.63</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Significant at p < 0.05

Table 2 shows that t-value calculated is 0.19 and a P_value of 0.03 which is lower than alpha significant value of 0.05. Null hypotheses one was therefore rejected. This therefore implies that the difference in performance between the experimental and control groups was significant. The difference must have been as a result of treatment, using peer-teaching approach to the experimental group. This shows that peer-teaching strategy was effective in enhancing pre-service teachers’ performance in mechanics.

**Research Question two:** What is the difference in the mean academic performance scores of male and female students taught physics using peer-teaching approach?

To answer RQ2, mean academic performance scores of male and female students exposed to the peer-teaching strategy was computed and presented in Table 3.

**Table 3: Post-test Mean Scores of Male and Female Subjects in Experimental Group**

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Sd</th>
<th>Men difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>34</td>
<td>60.51</td>
<td>12.63</td>
<td>5.18</td>
</tr>
<tr>
<td>Female</td>
<td>23</td>
<td>55.33</td>
<td>13.32</td>
<td></td>
</tr>
</tbody>
</table>

Table 3 shows the mean academic performance scores of male and female subjects exposed to peer-teaching to be 60.51 and 55.33 respectively. The mean difference was found to be 5.18. However, to test for the significance of the observed difference, null hypothesis two was tested.

**Null hypothesis two:** There is no significant difference in the academic performance mean scores between male and female students exposed to peer-teaching strategy. t-test statistic was used to test null hypothesis one and the result is presented in Table 4.

**Table 4: Result of t-test Analysis of Post-Test Mean Scores of Male and Female Subjects Exposed to Peer Teaching Approach**

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Sd</th>
<th>Df</th>
<th>t_cal</th>
<th>P_value</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>34</td>
<td>60.51</td>
<td>12.63</td>
<td>55</td>
<td>0.79</td>
<td>0.02</td>
<td>Significant</td>
</tr>
</tbody>
</table>
From Table 4, the value of calculated $t = 0.79$ with $P$ value is 0.02 with degree of freedom of 55. Determined $P$ value is lower than $P= 0.05$ the significant limiting value. Therefore, null hypothesis two was rejected. This implies that the mean difference in academic performance between male and female subjects in the experimental group was significant. The difference could be attributed to the treatment which means that the teaching strategy is not gender biased.

**DISCUSSION**

The findings of this research, which showed effectiveness of peer-group teaching approach agrees with the findings of Arco-Tirado, Fermandez-Marti and Fernandez-Balbora (2011) who found effectiveness in peer-tutoring as improving students’ grade point average, performance and learning rate among students in higher education. Naseerali (2013) also found that peer-group tutoring was effective in teaching physics in secondary schools. Hussain, Anwar and Majoka (2011) also agreed that peer-teaching enhances students’ ability to acquire knowledge and comprehension with some dimensions of academic achievement. In the same vein, Ullah, Tabassum and Kaleem (2018) in their study found out that peer-tutoring significantly enhanced the academic achievement of Biology students exposed to peer tutoring strategy. However, Aina (2017) found no significant difference between the experimental and control groups when taught electronics using peer tutoring strategy. The insignificant difference could be due to the size of sample used. The effectiveness of the peer group teaching approach could be due to a lot of activities in reading, rehearsing and peer tutoring involved before lesson presentation.

Pertaining gender and peer teaching, Ezenwosu and Nworgu (2013) found that male students performed slightly better than female students exposed to peer tutoring teaching of Biology. Geerlings, Cole, Batt and Martin-lynch (2016) reported that female students improved their Mathematics scores when they attended peer assisted study sessions. Ogundola (2017) found that peer tutoring was more effective in improving students’ cognitive achievement than conventional teaching method and that there was effect of gender on students’ achievement in favour of girls, in Technical Drawing.

**CONCLUSION**

Based on the outcome of the research, it can be concluded that peer-group teaching approach is effective in enhancing learning and academic performance of students in Physics. The approach is also gender insensitive.
RECOMMENDATIONS

Based on the efficacy of the peer-group approach as determined, it is recommended that the method should be adequately explored by physics teachers with a view to enhancing better learning and academic performance. Further studies should also be conducted on other topics and at other educational levels to ascertain wider effects and effective use of the teaching strategy for better scientific and technological development.

REFERENCES


