Education

Effects of Lecture and Demonstration Methods on the Academic Achievement of Students in Chemistry in Nassarawa Local Government Area of Kano State

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Abstract: This study was carried out to determine the effect of lecture and demonstration methods on academic achievement of students in Chemistry in the Nassarawa Local Government Area of Kano State. Fifty eight (58) Chemistry students (boys and girls) in the Senior Secondary School One (SS1) from two randomly selected schools were involved in the study. Necessary data were collected and the validated reliable data were analyzed using t-test at a significant level of 0.05. Results obtained revealed that students perform better in Chemistry when taught using the demonstration method as compared to the lecture method. The boys and girls are better in academic achievement when taught using demonstration method than when lecture method was used. The demonstration method shows equality in the performance of boys and girls. Hence the adoption of demonstration methods in the teaching and learning of Chemistry and science in general is hereby recommended.

Keywords: Education, lecture method, demonstration method, t-test.

1. Introduction

Science subjects constitute a major part of the subjects being offered in most post-primary institutions in Nigeria today. These subjects are so important that the Federal Government National
Policy on Education [1], Section 5, Item 22(c) states in specific terms that “The Secondary School Education shall provide trained manpower in the applied science and technology. The National Policy on Education [1] further states that science subjects constitute part of the core subjects at both Junior and Senior Secondary School levels. The importance attached to science by the Federal Government could be due to the general belief that science is capable of improving and changing skills, attitudes and cognition by increasing pupils, store of knowledge’s about themselves, their environment and their world.

The importance of chemistry in the development of any nation cannot be underrated especially in Nigeria where the national income rests on petroleum and petrochemical industries. The performance of chemistry students at the secondary and tertiary levels has been poor and deplorable over the years [2-4]. Analysis of students’ performance in the science at SSCE level as noted by Njoku [4] revealed that between 1980 and 1991, the annual average pass rate at credit level (grade 1-6) in chemistry was 15.41%, while the absolute failure rate (grade 9) was 61.82%.

Methodology is very vital in any teaching-learning situation. The method adopted by the teacher may promote or hinder learning. It may sharpen mental activities which are the bases of social power or may discourage initiatives and curiosity thus making self-reliance and survival difficult. There are different types of methods for efficient and effective teaching. These methods include: Lecture, demonstration, laboratory, field trip, assignment, peer-teaching method, etc.

The adoption of lecture method by most teachers in order to overcome the bulky chemistry syllabus before the SSCE affects students’ performance. Researchers believe that in the lecture method, theory is taught as an absolute knowledge; hence pupil-centered activities for developing scientific reasoning skills and processes are lacking. The lecture method is also known to cause lack of interest and poor performance in science as opined by Njoku [4]. Aghadinano [2] contended that science teaching limited exclusively to telling, reciting and testing of information is sterile as it does not convey either the meaning or intent of science. Akpan [5] specifically stated that this is the method dominating science teaching in Nigerian Secondary Schools. Mari [6] and Okebukola [7] have called for a change from lecture method in teaching Chemistry. This is because of its disadvantages in the learning of science in science classrooms. The demonstration method has the advantage of being a good way of motivating students to learn and also believed to save time and materials as well as shows how to avoid breakages and accidents. However, it does not allow pupils/students to develop manipulation demands for carrying out activities on their own. Also, less scope is covered in demonstration seeing details of objects being demonstration.

1.1. Statement of the Problem
Students’ persistent poor performance has been partly ascribed to inadequate teaching and instructional methods adopted by science teachers [8]. Derek [9] in supporting this view reported the seriousness of the deplorable performance of secondary school students in science subjects and identified persistent use of the traditional mode of instruction as one of the major short-coming affecting the learning and higher achievement in science subjects.

Chemistry as a science subject is bulky in nature. The subject teachers usually adopt lecture method in teaching in order to cover the syllabus within the stipulated time and this do not give room for proper understanding of the subject. The Chief WAEC Examiner Report [10] noted that the rush over the topics to cover could be responsible for the poor performance in chemistry.

In view of the foregoing, this study examined the acquisition of chemistry knowledge in the classroom using two instructional strategies: lecture and demonstration methods with the aim of determining the effect of each method on the academic achievement of students in Senior Secondary School Year one (SS1).

1.2. Research Question

The following research questions were formulated to guide the study:

i. Is there any difference in the academic achievement of students exposed to lecture method and those exposed to demonstration method?

ii. Is there any difference in the academic achievement of male students taught using lecture method and those taught using demonstration method?

iii. Is there any difference in the academic achievement of female students taught by demonstration method and those taught by lecture method?

iv. Is there any difference in the academic achievement between male and female students taught using demonstration method?

1.3. Significance of the Study

The search for innovations in industrial strategy is a continuous process in an educational system. The need to choose suitable instructional strategies in the teaching and learning of science has been of great importance.

Akpan [5] and Akinleye [11] in separate findings have stated that the prevailing teaching method in most Nigerian schools is lecture method. This method according to them does not allow active student’s participation in science lessons. Student memorizes and regurgitates facts and concepts.
Recent researches in science education have been geared towards improving the method of teaching science so as to improve students’ performance in science subject. This research work aims at finding out the effects of lecture and demonstration methods on the academic performance of students in Chemistry as a way of searching for more effective methods for teaching the subject and enhancing meaningful learning.

The findings might also influence the curriculum innovation programmes in Chemistry. Of importance in this study is the effect of lecture and demonstration method on the performance of male and female students taught using the strategies. The findings from this study would therefore shed light on the instructional strategy that as suitable for both sexes.

The findings from this research work is also hoped to provide a teaching/learning strategy that teachers’ of Chemistry could adopt so that students in their classes will benefit maximally, thereby meeting the needs of individual students in the class.

1.4. Basic Assumptions

- The schools used for the study were representative of secondary schools in the Nassarawa Local Government where the study was carried out.
- The lecture and demonstration method of teaching are appropriate for teaching the topic selected.
- The selected topic is appropriate for the class (SS1) used in the study as it is stated in the scheme of work.

2. Materials and Methods

2.1. Research Design

Two groups are used for this study; that is the experimental group students (exposed to demonstration method) and the control group student (exposed to the lecture method). This design have been described by Kelinger [12] and used by Ezenwa [13]. The population for the study comprises of all the Senior Secondary School one SS1 chemistry students in Gwagwaruwa zone Nassarawa Local Government Area of Kano State. There are nine (9) secondary schools in the zone. The total population of SS1 is 180 students which consist of 95 girls and 85 boys. The sample size was made up of 58 (fifty eight) SS1 Chemistry Students both boys and girls. This sample size is in accordance with the suggestion made by Roscoe [14] that at least 10% of the total population can be taken as sample size.

2.2. Samples and Sampling Procedure
The sample in the study involves two secondary schools (Yakub Memorial College and Fatimah International School, Kano). The schools selected at random using stratified random sampling techniques involving even and odd numbers. The even number formed the control group and the odd formed the experimental group.

3. Results and Discussion

3.1. Interpretation of Pre-test Scores

The students used for the study in both experimental and control groups were subjected to a pre-test which was marked and recorded. The scores obtained were compared using the t-test statistics and are presented in Table 4.1. From table 4.1, it is evident that there is no significant difference between the experimental and control group in their pre-test mean scores. This means that the students of both groups were equal in terms of their prior knowledge on the selected topics at the start of the study.

3.2. Hypotheses Testing

Null hypothesis 1

\[ H_{01} : \text{There is no significant difference in academic achievement of Chemistry students exposed to lecture method and those exposed to demonstration method.} \]

To test this hypothesis, the CAT post mean scores of both the experimental and control groups were compared using the t-test statistics. The result of the t-test is as shown in Table 4.2. The result obtained shows that there is significant difference between the two groups in terms of their mean academic achievement scores in the post test. This means experimental group had higher score than the control group; the null hypothesis is therefore rejected.

Null hypothesis 2

\[ H_{02} : \text{There is no significant difference in academic achievement of male Chemistry students exposed to lecture method and those taught using demonstration method.} \]

The hypotheses was tested by using the Chemistry Achievement Test post- test mean scores of male in the experimental and control group. The mean were compared using t –test statistics and results presented in Table 3. It can be deduced from the table that there is significant differences in the post- test mean scores between the boys within the lecture and demonstration method. This means the boys of the experimental group are better than those of the control group. The hypothesis is therefore rejected.
One can conclude from this result that demonstration method was more effective than lecture method in teaching Chemistry. This shows that the demonstration method facilitated the students understanding of the subject and thus better performance compared to the lecture method. This finding was ascertained by Shuaibu [15].

**Null hypotheses 3**

*H₀₃: There is no significant difference in academic achievement of female Chemistry students exposed to lecture method and those taught using demonstration method.*

The above hypothesis was subjected to t-test statistics using scores of females students obtained from the Chemistry achievement test of both groups and presented in Table 4. From the results obtained, it can be seen that there is significant difference in the mean scores of the post-test for female in the two groups. Females in the demonstration method had higher mean score than those of lecture method. This means females exposed to demonstration involving manipulation perform better than those taught using lecture method. The hypothesis is therefore rejected.

This could be concluded that a female exposed to demonstration which involves visual aids makes understanding and recalling easier and hence their high performance.

**Null hypothesis 4**

*H₀₄: There is no significant difference in academic achievement between male and female Chemistry taught using demonstration method.*

To determine whether the performance of the boys and girls differed following the respective treatments, the post-test mean academic scores were subjected to t-test. The result is shown in table 5. From the results obtained, it can be seen that there is no significant difference in the post-test mean achievement scores between males and females taught using demonstration method. Based on this result, the null hypothesis was retained.

The implication of this is that demonstration method tends to promote homogeneity of performance between the boys and girls. In other words, demonstration method is gender friendly. This finding is in support of that said; there is no gender discrimination in the learning of science.

**Table 1:** Comparison of the mean academic achievement scores of the pre-test for the experiment and control groups

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>X</th>
<th>Sd</th>
<th>df</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>29</td>
<td>6.3448</td>
<td>2.52524</td>
<td>56</td>
<td>0.285</td>
<td>0.778</td>
</tr>
<tr>
<td>Control</td>
<td>29</td>
<td>6.1724</td>
<td>2.45050</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Not significant at P ≤ 0.05; df = 56
Table 2: Comparison of the post-test mean scores of the experimental and control groups

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>X</th>
<th>sd</th>
<th>df</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>29</td>
<td>9.4828</td>
<td>1.82484</td>
<td>56</td>
<td>4.011</td>
<td>0.000</td>
</tr>
<tr>
<td>Control</td>
<td>29</td>
<td>7.1724</td>
<td>2.50811</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

There is significant difference at $P \leq 0.05$; $df = 56$.

Table 3: Comparison of the post-test mean scores of male in the experimental and control groups

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>X</th>
<th>sd</th>
<th>df</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>17</td>
<td>9.4118</td>
<td>2.09341</td>
<td>32</td>
<td>1.638</td>
<td>0.011</td>
</tr>
<tr>
<td>Control</td>
<td>17</td>
<td>8.1176</td>
<td>2.49706</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

There is significant difference at $P \leq 0.05$; $df = 32$.

Table 4: Comparison of the post-test mean scores of females in the experimental and control groups

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>X</th>
<th>sd</th>
<th>df</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>12</td>
<td>9.5833</td>
<td>1.44338</td>
<td>22</td>
<td>5.446</td>
<td>0.000</td>
</tr>
<tr>
<td>Control</td>
<td>12</td>
<td>5.8333</td>
<td>1.89896</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

There is significant difference at $P \leq 0.05$; $df = 22$.

Table 5: Comparison of the post-test mean scores of the experimental group by gender category

<table>
<thead>
<tr>
<th>Groups</th>
<th>Sex</th>
<th>N</th>
<th>X</th>
<th>sd</th>
<th>df</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>Male</td>
<td>17</td>
<td>9.4118</td>
<td>2.09341</td>
<td>27</td>
<td>0.245</td>
<td>0.808</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>12</td>
<td>9.5833</td>
<td>1.4438</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

No significant difference at $P \leq 0.05$; $df = 27$.

4. Conclusion

Based on the findings emanating from the study, the following conclusions and recommendations were drawn:

i. Students perform better in Chemistry when taught using the demonstration method as compared to the lecture method.

ii. The boys are better in academic achievement when taught using demonstration method than when lecture method is used.

iii. The girls achieve higher in Chemistry when taught using demonstration method than when taught using lecture method.

iv. The demonstration method shows equality in the performance of boys and girls.
v. The teaching of science in general and Chemistry in particular should be done in such a way that students learn effectively and perform to achieve high. The use of demonstration method seems to be suitable in achieving this goal.

vi. The use of lecture methods of teaching has been found in the study not be appropriate with respect to achievement in the learning of sciences. Science teachers should therefore exercise caution and expertise in its use so as to avoid a situation where low achievement is the outcome of instruction.

References


