Factors Affecting The Effective Use Of Laboratory In The Teaching And Learning Of Physics In Apa Local Government Area Of Benue State Nigeria.

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ABSTRACT
The study investigated the factors affecting the effective teaching and learning of physics in selected secondary schools in Apa Local Government Area of Benue State. The study is a survey which used questionnaire to collect information on the factors affecting the effective use of laboratory in the teaching and learning of physics in secondary schools. The sample consisted of 100 physics students randomly selected from the 10 schools of the study. Questionnaires were used to collect data from the students. Data collected were analyzed using mean and T-test statistics. The study revealed that qualification of teachers, standard and well equipped laboratories, and the location of laboratories are the factors that influence students’ effective use of the physics laboratory in secondary schools. Recommendations were made to individuals and organizations involved in the management of school science laboratories on how to proffer lasting solutions to the problems identified.

Keywords: Factors, effective use, teaching, learning, science laboratory.

Introduction:
For many years, human beings have been developing ways of making life better for himself. Man has developed utilities for war, agriculture, infrastructures and in many other areas. All these have been done through careful observations and data analyses. Thales philosophy of the 6th century BC to Plato and Anstotle logical philosophies of the 4th century BC have resulted in a lot of discourages. From the scientists of the Greek culture like Archimedes, Theophrastus, Hipparchus
to the modern scientists like Galileo, Newton, Faraday, Maxwell, Joule and Einstein, science laboratory remains their focal points.

The laboratory is unique in research for investigations. The laboratory has been given a central distinctive role in science education, and rich benefits accrue from using the laboratory. The laboratory is for teachers, students, teachers in training and the public (Adeyemi, 2008; Ige, 2000).

Researchers have found science laboratories to be central to the teaching of science in secondary schools (Adeyemi, 2008 & Ige, 2000). Laboratories have been found to be the scientists’ workshops where practical activities are conducted to enhance learning.

Jones (2000) examined teacher provision in the sciences in many countries and found that 45% of the schools surveyed indicated insufficient laboratories. His findings agreed with Barrow’s (2006) findings in Saudi Arabia which indicated inadequacy in the provision of laboratory facilities in schools. The findings were also consistent with those of Black (2003) who found in Uganda that science education is faced with the problem of lack of resources with half the schools having no real laboratory.

It was noted by Abdullahi (2004) that the first laboratory equipment used by earliest scientists were from their homes to teach science. The emphasis as at then was that science should not only be heard but be experienced where it is taught. As cited by Afolabi (2009) who investigated the effect of laboratory teaching method on academic achievement of students in physics. Balogun (2003) noted that 80% of failure of science students is due to the inability of the students to perform well in practicals. Some students never use the common physics apparatus before facing major examinations.

One of the objectives of secondary education as outlined by the Federal Republic of Nigeria (FRN), 1981 in the national policy on education was the learning of a sound basis for scientific and reflective thinking”. Clearly, this objective equips students to live effectively in
our modern age of science and technology”. For these objectives to be achieved, laboratories must be involved in the teaching of science and physics in particular in secondary schools.

**Significance of the Study**

The significance of this study cannot be undermined. The following among others are the significance of the study.

Findings of this study will make physics teachers to understand the need to adequately expose their students to routine practicals and also make physics teachers understand the need to always supervise their students while carrying out laboratory activities. This study is intended to get the physics teachers understand the need to ensure that materials and equipments are not only adequate, but also in proper working conditions and also see and understand the need to display and discuss the safety rules/regulations with students.

**Population and sample**

The population of this study consists of physics students in Apa Local Government Area of Benue State.

**Methodology**

This study is a survey which was designed to find out the factors affecting the effective use of laboratory in the teaching and learning of physics in secondary schools in Apa local government of Benue State.

The population of the study consisted of all the physics students in senior secondary schools in 3 local government areas of Benue. The three LGAs are from the three educational zones A, B and C, in Apa LGA of Benue State.

From each of these LGAs, 10 schools that met the requirements were selected from each of the schools, 10, physics students were selected at the SSII level. Parts of the criteria are that the school must have evidence of students’ enrolment in physics at the SSII level. Parts of the criteria are that the school must have evidence of students’ enrolment in physics at the SSII level, it must be a co-educational school, there must be a physics teacher and the laboratory must be fairly equipped.

The sample was then made up of 300 SSII students randomly selected from the schools of study.

**Instrument for data collection**
The instrument for data collection for the study is a questionnaire. The questionnaire was divided into three (3) sections. Section A sought to obtain information on the qualifications of physics teachers while section B is concerned with items on the level of utilization of equipments in the physics laboratory and section C consist of items on the location of the physics laboratory.

Validation of instrument

The questionnaire was submitted to experts for comments and corrections. All the experts agreed that the items can also serve the purpose of eliciting the desired information.

Techniques for Data Collection

The data was collected using a 4-point Likert scale and analyzed by two –tailed t-test to test significance of the factors affecting the effective teaching and learning of physics in secondary schools in Apa Local Government.

With a mean bench mark of 2.5 as calculated below:

\[
\bar{X} = \frac{\sum X}{N}
\]

Where \(\bar{X}\) = the mean
\(X\) = the frequency of the values attached to the parameters
\(N\) = The number of parameters or the variables
\[\sum X = 4 + 3 + 2 + 1 = 10\]
\(N = 4\)

Substituting \(\Rightarrow \frac{\bar{X}}{N} = 10/4 = 2.5\)

Results

Research Questions

1. What is the mean rating of the students on the factors affecting the students’ effective use of physics laboratory for learning in Benue State?

2. What is the mean rating of the male and female students on the factors affecting the students’ effective use of the physics laboratory for learning in Benue State.

Research Hypothesis: null hypotheses were formulated and tested at 0.5 level of significance.

Hypotheses

Ho1: There is no significant difference in the ratings of students on the factors affecting
the effective use of physics laboratory in the learning of physics in Benue State.

**Ho2:** There is no significant difference in the ratings of male and female students on the factors affecting the effective use of physics laboratory in the

**Hypothesis 1**
Qualification of physics teachers does not significantly affect the effective use of the laboratory in the teaching and learning of physics.

**Table 4: Independent Samples Test**

<table>
<thead>
<tr>
<th>Items on teachers qualification</th>
<th>Lavene’s test for equality of variances</th>
<th>T-test for equality of means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>Sig.</td>
</tr>
<tr>
<td>Equal variances assumed</td>
<td>0.69</td>
<td>0.40</td>
</tr>
<tr>
<td>Equal variances not assumed</td>
<td>6.92</td>
<td>63.02</td>
</tr>
</tbody>
</table>

Table 4 is an independent sample T-test for items on teacher’s qualification. The table reveals that the significant values for all the items above were less than 0.5, the set significant value for the study is (P=0.5). The hypothesis was 0.000 was therefore not accepted. The conclusion drawn was that, students with qualified teachers used the physics laboratory more than those with unqualified teachers.

**Hypothesis 2**
Lack of equipped physics laboratories does not significantly affect the effective use of laboratory in the teaching and learning of physics.

**Table 5: Independent sample test for items on the general level of equipments in the physics laboratory.**
Table 5 is an independent sample T-test for items on the general level of equipments in the physics laboratory. The table reveals that the significant values for all the items above were less than 0.5, the set significant value for the study is \( p=0.5 \). The hypothesis was 0.000 and was therefore not accepted. The conclusion drawn was that students with adequate physics equipment use the physics laboratory more than those without.

**Hypothesis 3**

Location of physics laboratories does not significantly affect the effective use of the laboratory in the teaching and learning of physics.

<table>
<thead>
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<th>Items on physics equipments</th>
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<th>T-test for equality of means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equal variances assumed</td>
<td>F = 0.78, Sig = 0.378</td>
<td>T = 6.779, df = 98, Sig(2-tailed) = 0.000, Mean difference = 0.639, Std. Error differences = 0.943</td>
</tr>
<tr>
<td>Equal variances not assumed</td>
<td>F = 6.318, df = 57.2477, Sig = 0.000</td>
<td>T = 0.639, Std. Error differences = 0.101</td>
</tr>
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Table 6 is an independent sample T-test for items on the location of the physics laboratory. The table reveals that the significant values for all the items

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</tr>
</tbody>
</table>
above were less than 0.5, the set significant value for the study is (P=0.5). The hypothesis was o0.000 and was therefore not accepted. The conclusion drawn was that laboratory location affects students’ use of physics laboratory as less students’ wanted to use laboratory on locations that were not conducive.

**Discussion of Findings**

These findings are in agreement with that of Ezellora (2000): which states that “good and qualified physics teachers help in students learning of physics”. Also, Adeyemi (2001) pointed out that, a well equipped and properly managed laboratory will improve the learning of physics and also enhance student’s retention of the topics taught. Also Aja (2003) stated that teaching in an ill-equipped laboratory is useless no matter how beautiful the structure of the building may be. Ezellora (2000) also pointed out that, the location of the laboratory greatly influences student’s utilization the laboratory. Because a laboratory sited in a noisy environment will not be conducive for learning due to the distraction from the environment.

**Conclusion**

It can be concluded that the qualification of physics teachers, the level of equipments in the physics laboratory and the location of the physics laboratory are the major factors affecting the effective use of the physics laboratory in the teaching and learning of physics. These factors need to be tackled and reduced if possible eradicated.

**Recommendations**

In view of the findings, the following recommendations were made:

- The school management board should endeavour to employ qualified physics teachers.
- The government and the parent teacher association (PTA) should endeavour to build well equipped physics laboratories.
- The building of the physics laboratory should be sited away from noisy areas.
- The environment for the laboratory should be conducive for practical work.
Teachers, proprietors, and the government must be prepared and encouraged to create awareness of the importance of laboratory practices to learning of theoretical physics.

REFERENCES


[35] Tamir (2007) “How are the laboratories used” journal of research in science teaching, 14, No. 4pp. 311 – 316.


