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Relationship between Laboratory Facilities' Utilization and Senior Secondary School Physics Students' Achievement in Federal Capital Territory, Abuja, Nigeria

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ABSTRACT

This study investigated the relationship between laboratory facilities and senior secondary school physics students' achievement in Federal Capital Territory, Abuja Nigeria. A sample size of 2505 students were selected from a population of 25050 using stratified random sampling based on 10% representation from the six local area councils in FCT were used for the study. Ex-post Facto research was used for the study. The data used for analyses were collected using Physics Laboratory Facilities Assessment Checklist (PLFAC) to classify the school variables into two groups. WASSCE physics result sheets from the year2011 to 2017 were sorted out to classify the students into two groups namely the Pass group with grades A1 to C6 and the Fail group with grades from D7 to F9. The analyses of these data using Pearson's Product Moment Correlation showed that laboratory facilities had significant relationship with students' achievement in Physics. Based on this finding, it was recommended that FCT educational authorities should provide adequate and functional laboratory facilities to enhance the teaching of physics in secondary schools.

Keywords: Relationship, Laboratory Facilities, Utilization, Physics, Achievement.

INTRODUCTION

Science education is the type of education that deals with the nature and body of knowledge which gave birth to several science disciplines such as biology, physics, chemistry, agriculture and basic science and technology. Without these bodies of knowledge there would have not been other disciplines such as engineering and technology. Physics as a branch of science deals with natural phenomena such as energy and matter and assists people to understand the increasing technological changing society (Zhaoyao, 2002).

The goals of physics education in secondary schools according to Federal Ministry of Education, Science and Technology (2004) are:

1. To provide basic literacy in physics for functional living in the society.
2. To acquire concepts and principles of physics as a presentation for further studies.
3. To stimulate and enhance creativity.

From the above goals, one can deduce that physics education enables the acquisition of scientific attitude, products and processes of science. Scientific attitude deals with the behavioural modification of a scientist in the area of honesty, humility, creativity, patience and perseverance. Scientific processes are the procedures scientists follow in carrying out their investigation. Scientific product is the findings of a research work such as generalization, theory, principles, laws and facts (Otuka & Uzoechi, 2009). Onah and Ogwu (2010) opined that senior secondary curriculum was built on the concept of science as a product and a process.

As a result of the importance of physics, students who intend to study sciences, engineering and technology programmes in higher institutions, need to pass physics at credit level and above at National examinations. The reason for this according to Anyebe (2007) is that physics is important in secondary

education because it is one of the foundational frameworks on which the entire scientific and technological machinery of a nation rests.

Despite the benefits of physics to the nation's development, students' achievement in physics in public examinations has been very poor over the years. Research finding has revealed that 41% students passed physics in 2017 NECO examination. Adeyegbe (2005) remarked that physics students' achievement in May/June WASSCE from 2007 to 2013 was below 50%. This failure trend has been a recurring incident in SSCE in Nigeria. Among several factors identified for this low achievement was inadequacy in physics laboratory facilities (Okegbile, 1996 & Raimi, 1998).

Physics practical is an important aspect of learning of physics because it equips students to develop skills in solving problems using experiments. Practical physics also plays an important part in the comprehension of physics lessons because science is best understood using discovery or inquiry method of teaching. In the society, science laboratory enables scientists to discover solutions to problems through experiments. Therefore, when there are poor laboratory facilities in schools, the art of science teaching is under threat (Fraser et.al, 1992).

Physics laboratory facilities consist of physics equipment and materials that are used in carrying out practical physics. Practical physics requires the utilization of physics laboratory facilities to successfully execute practical tasks. Therefore, where laboratory equipment are not available there cannot be any talk of utilization. Thus, practical physics require the utilization of physics laboratory facilities to successfully execute the tasks. As a result of this, schools that lack the minimum recommended laboratory equipment are not allowed to partake in SSCE. The reason is because insufficient laboratory facilities would prevent adequate utilization of them during SSCE practical examinations. Dahar and Faize (2011) observed that there is relationship between availability and use of science laboratories and academic achievement.

On the importance of laboratory facilities, Raimi (2002) found that laboratory facilities had significant effect on performance of students in physics. This finding was also supported by Onah and Ugwu (2010) who concluded that laboratory facilities have significant relationship with the performance of students in physics.

It is in view of the importance of laboratory facility in physics and the need for physics students to excel in the subject that this study set out to investigate the relationship between school laboratory facilities and students' achievement in physics in FCT, Abuja, Nigeria.

Research Question

What is the relationship between utilization of laboratory facilities and students' achievement in physics in secondary schools in Federal Capital Territory, Abuja?

Hypothesis

There is no significant relationship between students' achievement in physics and the utilization of laboratory facilities. This hypothesis was tested at 0.05 level of significance.

METHODOLOGY

This study adopted Ex-post facto research design. This research design is applicable where secondary data such as WASSCE results are used for analyses. These secondary data were analyzed based on the utilization of physics laboratory facilities in FCT secondary schools, to examine the effect of laboratory facilities on students' achievement in physics.

The population of this study comprised 25050 senior secondary schools students offering physics in 162 pubic senior secondary schools in Federal Capital Territory, Abuja. A sample of 2505 senior secondary schools students offering physics were selected from a population of 25050 senior secondary schools students using stratified random sampling technique.

The instrument for data collection was a Physics Laboratory Assessment Checklist (PLFAC) which is a questionnaire that required information on the availability and utilization of physics laboratory equipment. The PLFAC was validated by two experts in the Department of Science, Technology and Mathematics Education, Faculty of Education, Nasarawa State University, Keffi. Secondary data used for this study was WASSCE results of May-June 2011 to 2017.

The research question was answered using correlation coefficients and bar-chart to compare the relationship between laboratory facilities and students' achievement in physics while the hypothesis was tested using Pearson Product Moment Correlation (PPMC). The computed PPMC from the analyses was compared with PPMC tabular value at 0.05 level of significance.

RESULTS

Research Question: *What is the relationship between utilization of laboratory facilities and students' achievement in physics in secondary schools in Federal Capital Territory, Abuja, Nigeria?*

Table 1: Distribution of May/June WASSCE Students Achievement in Physics by Laboratory Facilities and Physics Achievement

Year	Total no. of Students	No. of Students in Utilized Laboratory Schools	No. of Students in Non-Utilized Laboratory Schools	No./ % Pass (A1-C6) of Students in Utilized Laboratory Schools	No./ % Pass (A1-C6) of Students in Non-Utilized Laboratory Schools	Correlation Coefficient
2011	831	383	448	200(52%)	188(42%)	0.10
2012	810	343	467	161(47%)	223(48%)	0.008
2013	827	344	483	164(48%)	215(45%)	0.03
2014	833	350	470	205(59%)	175(37%)	0.02
2015	815	348	467	210(60%)	169(36%)	0.01
2016	864	388	476	201(52%)	186(39%)	0.005
2017	901	409	492	236(58%)	147(30%)	0.014

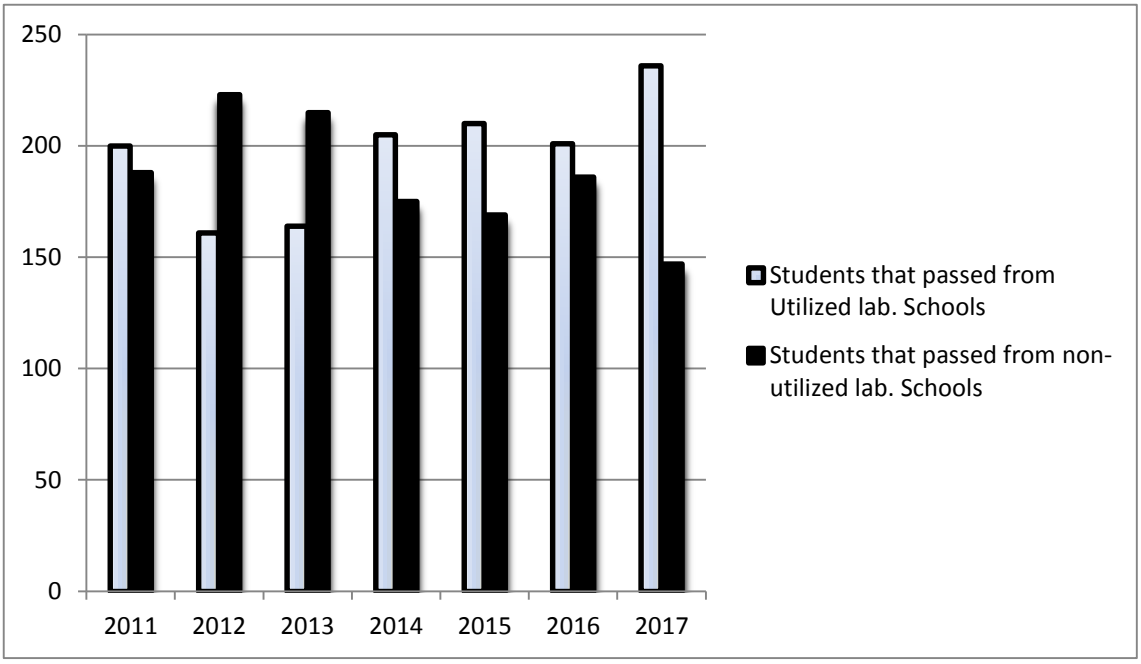

Fig. 1: Bar Chart of May/June WASSCE Students Achievement in Physics Laboratory Facilities

Table 1 shows that physics students that were taught not utilizing laboratory facilities performed lower compared to physics students that were taught utilizing laboratory facilities. The correlation coefficient shows a low positive correlation coefficient between utilized laboratory facilities and physics achievement.

Figure1 shows that the percentage of students that got Pass mark (A1-C6) in schools that utilized laboratory facilities were higher compared to students in schools that did not utilize laboratory facilities.

Hypothesis

There is no significant relationship between students' achievement in physics and the utilization of laboratory facilities.

In testing the hypothesis, Pearson's Product Moment Correlation was used to analyze the relationship between physics students in schools whose laboratory facilities were utilized and those physics students in schools whose laboratory facilities were not utilized.

Table 2: Test of Hypothesis on the Relationship between Laboratory Facilities and Achievement in Physics

S/N	Laboratory Facilities	D.F	PPMC	Tabular value	Decision
1	Utilized	1069	1.04	0.95	Rejected
2	Not Utilized	1397			

Table 2 shows that the calculated PPMC value was greater than the PPMC tabular value at 0.05 level of significance. The null hypothesis of no significant relationship between students' achievement in physics and the utilization of laboratory facilities is therefore rejected. This implies that there was a significant relationship between students' achievement scores in physics and the utilization of laboratory facilities in secondary schools in FCT, Abuja.

DISCUSSION

Physics students in schools where laboratory facilities were utilized did better than those physics students in schools where laboratory facilities were not utilized. This finding agrees with that of Dahar and Faize (2011) who found that utilization of laboratory facilities had significant effect on students' achievement in physics. The reason for this outcome may be that utilization of laboratory facilities enable students to acquire greater knowledge of physics practical needed to excel in physics examination. However, the finding contradicts that of Owoeye and Yara (2011) who found that utilization of laboratory facilities did not influence students learning outcome. The reason for this difference may be that the researchers did not conduct their research in science-based subjects as every science subject has a practical component and the achievement of students depends heavily on the utilization of laboratory facilities for teaching demonstration and students' practice.

CONCLUSION

The study concludes that laboratory facilities have a positive relationship with students' achievement in physics and that its utilization can help increase students' achievement in physics in Federal Capital Territory, Abuja.

RECOMMENDATIONS

The study therefore recommends that:

1. Physics teachers should be encouraged to make use of the laboratory facilities provided for teaching of physics practical in secondary schools in FCT, Abuja, Nigeria.
2. Federal Capital Territory Educational agencies should set up laboratory facilities maintenance agencies to be saddled with the responsibility of providing and maintaining broken down laboratory equipment.

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