

## RELATIONSHIP BETWEEN SECONDARY SCHOOL STUDENTS' PERFORMANCE IN THEORETICAL AND PRACTICAL PHYSICS IN GOMBE METROPOLIS

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### Abstract

The research was designed to study relationship between students' performance in theoretical and practical physics under some learning conditions, practical and theory. Quasi-experimental pretest-post-test design was adopted. The population of the study comprised of all science students in Gombe metropolis, out of which 90 students were purposely selected to form the sample for the study. One research question was answered, while one null hypothesis was formulated and tested at 0.05 level of significance using the t-test statistics. The findings from the study showed that academic performance of students exposed to practical activity based method (guided discovery instructional method) was significantly higher than their counterparts exposed to the lecture method. There was no significant difference between students' performance in both theoretical physics and practicals physics in the experimental group. A Physics Performance Test (PPT) was the instrument used in collecting data for the study. The instrument was made up of Physics Performance Test (PPT) consisted of two parts. Part A was made of multiple choice items and part B was on essay practical work. It consisted of three questions for students to answer two. The instruments were administered to 90 (SSIII) students offering physics at the senior secondary level in Gombe metropolis. The mean and standard deviation was and t-test statistics were used for the data analysis. Results showed that there was a statistically significant relationship between the students' performance in theoretical and practical physics at  $P \leq 0.05$ . This suggests that physics teachers must understand that theoretical and practical physics play complementary role to one another and that performance in one aspect reinforce the other. The researchers recommended among others that teachers should put more efforts in teaching students both the theoretical and practical aspect of physics as this level which would make the students to understand or perform better in physics.

**KEYWORDS:** *performance, physics, theory, practical.*

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### Introduction.

Physics like any science subject, practical and theoretical aspect is to extent; complement one another in the teaching and learning activities in schools. Although individuals' perception about the relationship between practical and

theoretical aspects of the subject may differ, it is generally agreed that sound knowledge of practical work, permitting individual observations and experience is most important in learning physics concepts and principles (Muit, 1972). The two parts are divided primarily for teaching convenience, but like any

achievement test performance of students may differ due to largely varying manipulative skills, sense of detection and locality of students. It is suggested that by physicist that teachers should try hard to present the unfortunate tendency to dissociate the practical work of laboratory distinctively from the theoretical knowledge of the lecture-room (Otuka, 2010). Gbananja (1991) suggested that practical activities in science teaching and learning develop in learners:

- i. Acquisitive skills
- ii. Organizational skills
- iii. Creative skills
- iv. Manipulative skills
- v. Communicative skills

The statement “What I hear I forget but what I do I remember” is very true of science. Students deserve to be assessed on the range of abilities they have been and are capable of manipulating the overall assessment plan should reflect students’ different learning style, and different ways of manifesting them. Many scholars are of the view that physics is the branch of science which is largely concerned with fundamental ideas about nature and attempt to establish simple relationship between different quantities as precise as possible (Otuka, 2010). Musa (2012) opines that physics deals with matter in relation to energy.

Nsofor (1998), and Abdullahi (2009) observe that the spring board for science and technology among others is a well-grounded knowledge in mathematics and physics, which are regarded as the soul of science that propel all the science and technology oriented disciplines. It is a common knowledge today in spite of the indispensability of physics, majority of our

students exhibit lukewarm attitude towards its study. They also not only fear the subject, but also really hate it.

Saskatchewan Education (1998) reported that in science, assessment can be based on oral or written response or observations of performance. Ideally, it will be a combination of these, though performance in two aspects may vary from student to student due to varying skills and knowledge. Practical and theory are two sides of a single coin with performance in one reinforcing the other; for example, reading an ammeter diagram is not the same as knowing how best to measure using it to find current of particular circuit. Practical gives opportunity to Observe, Calculate, Manipulate, which is aimed at improving students’ accuracy and precision. On the other hand, theoretical physics assessment may involve students’ ability to mental reasoning/abstract reasoning, logical and interpretations of physics concepts and principles. It also assess students’ ability to recall, stored information as well as development of critical and creative thinking which promote and challenge higher level of thinking (Saskatchewan, 1998).

### **Statement of the Problem**

Physics is one of the basic science subjects which deals with the study of matter and energy and how they interact. It is the study of matter and natural events, which is based mostly on empirical observations and quantitative measurements. Physics is a practical and experimental science. The importance of physics to scientific and technological development cannot be over-emphasized. This is because the subject is crucial for effective living in the modern age of science and technology. Physics has

a wider application in industry and other professions that is why it is necessary that every student should be given an opportunity to acquire some of its concepts, principles and skills. In order for students to achieve these, there is need for the students to be well grounded in both theory and practical activities.

The Federal Ministry of Education (FME, 2009) stated that in order to stimulate creativity and develop process skills and correct attitude in students, the subject is student-activity oriented with emphasis on experimentation, questioning, discussion and problem-solving. Meaningful learning of physics cannot be carried out without the practical aspect of physics. What is usually obtained in schools today is that practicals are left until the students are about writing their terminal examinations and science cannot be learnt until it is felt (Agbo, 2002). There has been a general concern among science educators about students' poor performance in physics theory and practical in Nigerian schools. According to Hassan cited in (Ebute, 2008) four factors are causing poor performance in physics theory and practicals. These include factors residing with our society, factors residing within school, factors inherent in the family and factors inherent in the learners, Onuoha cited in (Bahago, 2015) stated shortage of qualified and dedicated teachers as some of the factors affecting students' performance in science and that poor practical orientation will lead to poor understanding of the theory. Ukuma (1990) found that over 80 % of failure in science and technology are due to the inability of students to perform well in practicals. Indeed, for students to perform

well in physics there is need for the students to possess good practical skills.

### **Significance of the Study**

The objective of the study is to find out the extent to which performance in practical relates to performance in theoretical aspects of physics. This is with a view to establishing how one aspect harmoniously assists in learning the other. This would assist the teachers to have wider understanding of handling the two aspects.

### **Aim of the Study**

The purpose of the study is to find the relationship between secondary school students' performance in theoretical and practical physics in Gombe metropolis. The objective of the study was to;

- i. Find out the relationship between students' performance in theoretical physics and performance in practical physics in secondary schools.

### **Research Question One**

One question was formulated to guide the study.

- i. To what extent does the students' performance in theoretical physics exposed to lecture method relate to their academic performance in practical physics using practical activity based method in secondary schools?

### **Research Hypothesis**

One null hypothesis was formulated and tested at 0.05 level of significance.

- i. There is no significant relationship between students' performance in theoretical physics exposed to lecture method and practical physics exposed to activity based method in secondary schools.

### Methodology

The design used in the study was quasi-experimental control design of pretest post-test. The study was restricted to SSS III students in which a single group of students (SSIII) are being examined to find the effects of the performance in relation to the two aspects of physics (theory and practical).

The population for the study comprised of all the science schools in Gombe metropolis. There are 5 science senior secondary schools in Gombe metropolis with the total of 500 (SSS III) science students. These students constitute the target population from which the sample was drawn.

Four secondary schools were selected for the purpose of this research consisting of ninety (90) students of the final year (SSS III) offering physics as one of the science subjects. The sampling technique adopted was intact class. This implies that only the students found in the class were used.

All students were pretested, and a t-test statistical tool was used to test the hypothesis. The students' scores that did not differ significantly were randomly assigned as experimental and control groups.

The instrument used was Physics Performance Test (PPT) was developed on Ohms' law of electricity, Hooke's law of elasticity and optics concepts of physics. It had a reliability coefficient of 0.77, and was submitted to experts for content and face validity.

A pretest was administered to both experimental and control groups before the commencement of the treatment in order to determine the equivalence of the groups in knowledge and ability. The control group was taught theoretical physics aspects using lecture method, while the experimental group was taught the practical physics aspects using practical activity based method.

The researchers taught both groups for three weeks. A post-test was administered to groups at the end of the treatment, in order to determine the effectiveness of the lecture and practical activity based methods. After three weeks, a post-test test was administered to both experimental and control groups to determine the extent to which the learnt materials had been retained.

The results obtained from the research instrument was scored using marking scheme developed by the researchers and the data were analyzed using t-test statistical tool at probability  $P \leq 0.05$  level of significance for retaining or rejecting the null hypothesis.

- i. Test 1 consisted of physics multiple choice questions of 40 items on theoretical physics.
- ii. Test 2 consisted of easy questions on Ohms' law

electricity, Hooke's law of elasticity and optics as practical test. The test questions were developed by the researchers and validated by two senior secondary school physics teachers and two senior science education lecturers of Gombe State University, Gombe. The reliability coefficient of the tests (I and II) determined by the split-half method was 0.77. Test I and II carry 50 marks each. Any wrong answers attract zero mark and correct answer attracts 1 mark. The questions were attempted within a specified time.

## Results

The research question was answered using mean and standard deviation while the hypothesis was tested using t-test statistics. The results of the study are presented in Tables 1 to 2.

**Research Question1:** To what extent does the students' performance in theoretical physics

exposed to lecture method relate to their academic performance in

practical physics using practical activity based method in secondary

schools?

**Table 1: Mean and Standard Deviation of post-test Relationship between students' performance in theoretical physics (X) and their Performance in practical physics(Y)**

Groups	N	X	S.D
Experimental	45	36.15	6.823
Control	45	26.75	6.812

Result in Table 1 shows that students taught with practical activity based method (guided discovery method) had a mean academic performance score of 36.15 with a standard deviation of 6.82, while students taught with lecture method had a mean academic performance score of 26.75 with standard deviation of 6.81. This result shows that those taught using practical activity based approach performed better than their counterparts taught with the lecture method. This answer Research Question 1.

We could therefore deduce that students who perform well in theoretical physics

are likely to do well in practical physics and vice-versa. This is because performance in theoretical physics relates positively to performance in practical physics.

**Research Hypothesis One:** There is no significant relationship between students' performance

in theoretical physics exposed to lecture method and practical

Physics exposed to activity based method in secondary schools.

**Table 2: t-test Analysis of Mean Academic Performance Score of the Experimental and Control groups in Post-posttest**

Variables	N	X	S.D	SE	df	t-Value	p-value
Remarks							
Experimental	45	36.15	6.823	1.31	88		1.31
Control	45	26.75	6.812	1.20			

Significant at  $\leq 0.05$

Table 2 indicates that p-value obtained is 0.006 at  $P \leq 0.05$  level of significance. The p-value 0.006 obtained is significant since it is less than the 0.05 level of significance set for the study. Thus, there was a significant relationship in the

academic achievement between the experimental and control groups. Therefore, the null hypothesis was rejected and alternative hypothesis upheld. This shows that there is significant relationship between students'

performance in theoretical physics and practical physics.

This finding conforms to the finding of Saskatchewan Education (1998). Allen (2001) and Morgan (2001). Practical physics deals with both cognitive and manipulative skills of students. Whereas, theoretical aspects deals with cognitive and logical attributes of learner's (Muir, 1972). The two aspects therefore play complementary role to each other. Theoretical physics and practical do not have boundaries. They are two sides of the single coin and they are separated for only teaching and learning conveniences.

### Conclusion

Teaching physics like any other science subject could prove difficult if teachers try to limit their activities to lecture rooms. A science teacher must be versatile, innovative and resourceful enough so as to enable carry his students along in the process of his lesson delivery. He must use a combination of techniques for students to comprehend physics concepts and principles. This may involve the use of simple science language, analogy and fields trips. Above all, introduce practical activities in physics laboratory as much as possible. Science is everywhere and we must not give the impression that it is only learnt in the laboratory.

### Recommendations

Based on findings of the study, the following recommendations were made:

1. Teaching physics in the class room, likely any other science subjects could sometimes be boring. Hence, teachers should strive to make their teaching activities more practical oriented.

2. Since practical and theory are congruent to each other, teachers must try to avoid unnecessary distinction or demarcation, rather they should try to enlighten students on the need to concentrate on practical activities.
3. Government as the major key player in the provision of teaching instructional materials must be alive to its responsibility in this regard, no matter how serious a teacher is on practical, he remains handicapped if the materials are not there for effective teaching and learning.
4. Laboratory activities and maintenance must be taken lightly by teachers. All safety rules and regulations must be strictly enforced so as to safeguard unwanted occurrences.

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