

ANALYSIS OF GENDER PERFORMANCE IN SENIOR SECONDARY SCHOOL PRACTICAL PHYSICS IN GOMBE METROPOLIS, GOMBE STATE

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Abstract

The study analysed the gender and performance of senior secondary school students in practical physics in the Gombe metropolis, Gombe state. The study adopted the pure experimental research design of randomized subjects, post-tests, and experimental groups. The target population comprised all Senior Secondary School second year (S.S II) physics students in Gombe metropolis, Gombe State in the year 2017. The study was guided by three research questions and one hypothesis. A random sampling technique was adopted to select 80 subjects, 40 male and 40 female from the two randomly selected schools in Gombe metropolis. The instrument used for data collection was the Practical Physics Achievement Test (PPAT) which was adopted from NECO (E-5051) and NABTEB (2015) practical physics past questions. The instrument was assumed to be of high reliability since the test items were adopted from standardized tests. The data collected were analysed using mean, standard deviation, and t-test at a level of significance of 0.05. This indicates that there is a significant difference in the practical physics performance of male and female students in favour of the male students in the PPAT, $t = 0.704$, $df = 78$, $p > 0.05$. Based on the findings, it is recommended with the help of qualified teachers, female students should be encouraged to participate actively in the practical aspect of the subject. This may enhance their achievement and motivate them to study physics and physics-related disciplines in secondary schools and tertiary institutions.

Keywords: Analysis, Gender, Performance, Practical physics.

Introduction

Every nation is striving to be scientifically, technologically, and industrially developed including Nigeria. Achieving this objective depends to a large extent on the level of scientific education of her citizens (Awotua, *et al.*, 2015). The fact that science is the basis of technology and physics is of relevance to the scientific, technological, and industrial development of nations cannot be refuted. Science comprises some basic disciplines such as physics, chemistry, Astronomy, Mathematics, and others so numerous to enumerate. Physics is a core science subject that is crucial to the understanding of the world around us, a basic tool for understanding the complexities of modern technology and is essential for the technological advancement of a nation (Agommnoh & Ifenacho., 2013).

Allotey (2005) recognized physics as an integrated discipline that concerns itself with other disciplines that seem to be uniquely associated with manpower development. According to Elijah, Linet, and Fredrick (2015) physics as a science subject in secondary schools has a lot of contribution to students' career preparation, particularly in

engineering, medicine, and pure science. Therefore, it is crucial that students are not only prepared to pass the final year Physics exams but that they are prepared for Physics-related career choices and application of Physics in real life (Aina, 2014).

Erisnosho (2013); observed that there is a massive failure in National examinations like NECO in physics and that slightly over 30% of students who registered for physics passed at the credit level. Physics as one of the core science subjects taught at the senior science secondary school level of the educational system in Nigeria is taught both as theory (theoretical knowledge) and practical. In both internal and external examinations, practical physics is assessed separately as an integral part of the subject (Adeyemo, 2010). Most studies on how to mediate the problem of students' poor performance in physics focused on theory to the detriment of the practical neglecting the fact that the two are complementary. Physics is offered by both male and female students and are expected to perform equally well.

The issue of the performance of students in physics based on gender had been with mixed

results. Some believed that there is no significant difference between male and female performance in physics while others said there is a significant difference (Stephen, 2010). The difference in participation and performance between male and female students was found in several different subjects examined at the secondary school level (Bitrus & Domiya, 2016)). Okereke (2013) observed that despite controlling other factors the result showed that female students perform significantly worse in physics than male students. Could the difference in performance between male and female students in physics come from their theoretical knowledge or practical knowledge? The fact that the female sex constitutes at least 60% of Nigeria's population is not refutable.

Nigeria cannot afford to lose its contribution to the national development in this field (physics) in order to achieve its' bid for scientific, technological, and industrial development. The questions that may be asked are: - Could the students' performance in practical physics be a contributing factor to the poor performance trend documented? Is there any difference in the performance of male and female students in practical physics? These questions evoked the need for this study titled; Comparative analysis of the performance of secondary school students in practical physics based on gender in Gombe metropolis, Gombe state.

Statement of the Problem

Physics is one of the core science subjects taught at the senior secondary school level in Nigeria and is taught both as theory and practical. In the Senior Secondary School Examinations (SSCE) administered by the West African Examination Council (WAEC), National Examination Council (NECO), and National Business and Technical Examination Board (NABTEB), practical physics is assessed separately as an integral part of the subject. Both male and female students offer physics in senior secondary schools.

The level of participation and performance of female students in science in general and physics were found to be low in secondary schools (Bitrus & Domiya, 2016). The case is not different in Gombe, Gombe State. Most studies on how to mediate the problem of students' poor performance in physics focused on the theory

(theoretical knowledge) to the detriment of the practical knowledge possessed by the students neglecting the fact that the two are complementary. The performance of male students in practical physics is expected to be the same as that of their female counterparts. The questions that may be asked are: - Could the students' performance in practical physics be a contributing factor to the poor performance trend documented? Is there any difference in the performance of male and female students in practical physics? To answer these questions instigated the need for this study on comparative analysis of senior secondary school students' performance in practical physics based on gender in Gombe, Gombe state.

Literature Review

Experimental work and scientific investigations are other ways be called practical work (Ramnarain, 2011). Students will learn the science concept by doing experiments in the Laboratory which is a different approach from the "Chalk and Talk" method (Bruner, 1990). Therefore, the laboratory experiment is one example of practical work at the secondary school level (Musasia, *et al.*, 2012).

The traditional teaching approach is defined as teaching entirely dependent on textbooks where the teacher teaches the content and students just sit, read, do assignments, and take notes (Ates & Eryilmaz, 2011). Traditional teaching classes look like one-person shows that were usually controlled by direct and one-party instruction (Abida & Muhammad, 2012). At the same time, students are just unresponsively receiving information from the teachers (Liu, 2014) and without questioning the teacher (Stofflett, 1999).

According to a report done in Malaysia in 1996 by Federal Schools Inspectorate (Salmiza & Afik, 2012), teachers in Malaysia mostly were knowledgeable, familiar with the teaching contents and used various kind of techniques in teaching, yet the teaching method was still teacher centred. This method of teaching is still going on after 15 years of the report has been published and the teaching practices are still a one way, teacher-centred which makes students behave passively in the classroom (Salmiza & Afik, 2012).

Hands-on methods are suggested in constructivist-based learning (Ng & Nguyen, 2006). Another

alternative constructivist learning approach is the use of practical work in science teaching and learning. By having real-life phenomena, students are given the opportunity to evaluate and measure their views and to improve their understanding before the learning process (Ng & Nguyen, 2006). Practical work creates exceptional learning surrounding that help student construct their knowledge, and enhance logical, inquiry, and psychomotor skills (Mashita, Norita, & Zurida, 2009). Besides, practical work offers an interactive experience to the students where they can broaden the scope of constructivist learning (Umar, *et al.*, 2005). The education system in Malaysia is still very exam-oriented which focuses on examination results and marks (Sharifah Fauziah, *et al.*, 2012). Malaysian teachers are also unfamiliar to apply the constructivism approach in teaching. Therefore, teachers will be more teacher-centered rather than student-centred and the constructivist approach is unachievable (Arlina & Melor, 2014).

It is believed that by having practical work, students' knowledge can be expanded to understand the real world (Millar, 2004). Teaching objectives can be achieved easily by doing practical work, especially in teaching physics (El-rabadi, 2013). Furthermore, first-hand knowledge of the physics concept will be generated where students can understand the abstract ideas which are difficult to explain during the class (Osborne, 2002). Students' understanding of theories and models can also be developed (Millar & Abrahams, 2009). According to Musasia *et al.* (2012), students are faster to understand physics concepts when they test the experiment by themselves as they can touch the materials and apparatus which makes them believe in the experiment.

The objective of the study

The main objective of the study is to investigate students' performance in practical physics based on gender in some selected science secondary schools in Gombe metropolis.

To achieve this purpose, the following specific objectives were drawn: -

- i. To determine the performance of male students in practical physics.
- ii. To determine the performance of female students in practical physics.

- iii. To compare the performance of male and female students in practical physics.

Research Questions

The following research questions were generated to guide the conduct of the study.

- (i) What is the mean performance score of male students in practical physics?
- (ii) What is the mean performance score of female students in practical physics?
- (iii) What is the difference in the mean performance score of male students to that of their female counterparts in practical physics?

Research Hypothesis

The following hypotheses have been formulated in line with the research questions to guide the study.

- H₀** There is no significant difference in the mean performance score of male students to that of their female counterparts in practical physics.
- H₁** There is a significant difference in the mean performance score of male students to that of their female counterparts in practical physics.

Scope of the study

This study is on comparative analysis of senior secondary school students' performance in practical physics based on gender in Gombe metropolis, Gombe State.

The two selected senior secondary schools are:

- (i). Government Science II Secondary School Gombe
- (i). Government Comprehensive Day Secondary School Gombe

Methodology

The research design for the study is purely experimental. It is a post-test and experimental group design. The target population comprised all senior secondary school second year (S.S II) physics students in Gombe metropolis. The study adopted multistage sampling techniques. Two schools were randomly selected from the senior secondary schools offering physics. From the selected schools, 80 students (40 from each school) were also randomly selected. In each of the selected schools, 20 male and 20 female physics students were randomly selected.

The instrument for data collection was the Practical Physics Achievement Test (PPAT) which the researcher adopted from NECO and NAPTEB practical physics past question papers

respectively. Copies of the instruments were given to some lecturers in the physics education department of the Federal College of Education (Tech) Gombe for validation. The instrument was assumed to be reliable since the questions were adopted from National Examination bodies. The students were taught for three weeks, and a post-test was administered to the groups. The experiments conducted are:

- i. To determine the acceleration due to gravity "g" using a pendulum bob.
- ii. To determine the refractive index of a rectangular glass block.
- iii. Verification of Ohm's law.

The students' performance scores in the PPAT constituted the data for the study and were analysed using descriptive statistics that are mean standard deviation and t-test.

Results

Table.1: Descriptive Statistics of Mean Scores for Students in PPAT.

Sex	N	\bar{x}	S.D	Mean difference
Male	40	53.40	19.40	9.10
Female	40	44.30	18.56	

Table 1 answered research questions 1, 2, and 3. The mean performance score for males is 53.40, for a female is 44.30 and the difference in the mean

performance score of male and female students is 9.10.

Table 2: Summary of t-test Analysis of male and female students' scores in practical physics achievement test (PPAT).

Sex	N	\bar{x}	Std. Dev	Mean. Diff	Df	t	Sig (2-tailed)
Male	40	53.40	19.40	9.10	78	0.704	0.941
Female	40	44.30	18.56				

At 0.05 level of significance and $df = 78$, $t = 0.704$, and $p > 0.05$, the null hypothesis is therefore rejected. This indicates that there is a significant difference in the practical physics achievement of male students and their female counterparts.

Findings

From the data analysed, the findings revealed that gender seemed to have a slight differential effect on students' performance in practical physics. This is because, in table 1, male students had a mean score of 53.40 and a standard deviation score of 19.40 while female students had a mean score of 44.30 and a standard deviation score of 18.56. Also in table 2, at 0.05 level of significance and $df = 78$, $t = 0.704$, and $p > 0.05$, the null hypothesis was therefore rejected. This indicates that there is a significant difference in the practical physics performance of male students and their female counterparts in favour of the male.

Conclusion

From the findings, the male students perform significantly better than their female counterparts in practical physics in senior secondary schools in Gombe metropolis, Gombe state, and based upon the findings of this study, it was concluded that there is a significant difference in students' gender academic performance in practical physics and retention of theoretical works. This implies that for Female students to distinguish themselves from their male counterparts in cognitive, affective, and psychomotor skills of practical physics, there need to be help them from qualified physics teachers: female students should also be encouraged to participate actively in the practical aspect of the subject. This may enhance their achievement and motivate them to study physics and physics-related disciplines in both secondary schools and tertiary institutions. Consequently, With the help of qualified teachers, female students should be

encouraged to participate actively in the practical aspect of the subject. This may enhance their achievement and motivate them to study physics and physics-related disciplines in secondary schools and tertiary institutions.

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