

GENDER BASED RELATIONSHIP: STUDENTS' PERFORMANCE IN MATHEMATICS AND PHYSICS IN WEST AFRICAN SENIOR CERTIFICATE EXAMINATION (WASSCE)

By

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Abstract

This study established the relationship between students' performance in Mathematics and Physics in West African Senior School Certificate Examination (WASSCE) results in 12 sampled Secondary Schools in Nsukka Local Government Area, Enugu State of Nigeria. The study adopted correlation survey design. The target population for the study was Senior Secondary III (SS III) Mathematics and Physics students of public secondary schools in Nsukka Local Government Area. A total of 1060 Mathematics and Physics Students were used as sample for the study which comprises 611 males and 449 females. Students' Academic Performance in Mathematics and Physics proforma was used for data collection. Data collected were analyzed using Pearson' Product Moment Correlation and t-test of independent samples. The findings of the study revealed that Mathematics students' performance has significant moderate positive relationship with their Physics performance in senior secondary schools. It was equally revealed that there is a significant moderating influence of gender on the relationship between students' performance in Mathematics and Physics in WASSCE in favour of the male students. The implication of this is that female students will continue to lag on their male counterpart unless extra effort is put in place to close the gender disparity gap. As a result, it was recommended among others that extra efforts should be put in place by both Mathematics and Physics teachers in order to bridge the gender disparity gap in Mathematics and Physics.

Keywords: Relationship, Performance, Mathematics, Physics, Examinations

Although mathematical ability and opinions about mathematics vary widely, even among educated people, there is certainly widespread agreement that Mathematics is logical. On this premise, Yeo (2013) is of the view that Mathematics is an intrinsic component of science and serves as a universal language and indispensable source of intellectual tool. Mathematics is enshrined in the National Policy on Education (NPE) as a core and compulsory subject for all primary and post-primary school students in Nigeria (Federal Republic of Nigeria (FRN), 2009). However, students' performances in the subject are not encouraging. The evidence of students' poor performance in Mathematics compare to other subjects like Chemistry, Biology, Physics, and Geography among others is seen in West Africa Senior School Certificate Examination (WASSCE) Chief Examiner's Report (W.A.E.C., 2016). Mathematics forms a strong foundation for the study of Physics (Adeoye, 2010).

Physics helps the learners to develop critical thinking due to its high reliance on Mathematical concepts and logics (John, 2015). Physics develops the scientific habits in students which are transferrable to other areas in life (Lyons, 2005). Physics prepares students for vocations and careers at tertiary levels of learning and it is like a pivot joint in the Nigeria Secondary Schools Curriculum since other subjects such as Chemistry, Biology and Geography depend on it (Otieno, 2009).

The decline in performance rate in Physics in all levels of education has been the case in many countries including the USA, UK, Netherlands and Nigeria (Osborne, Simon & Collins, 2003). Boyes & Dickson (2003) noted that the fact that Mathematics is not a favorite subject for most low performing students could be a reason why they shy away from Physics. Students who perform well in Mathematics are likely to enroll and perform better in Physics (Adeoye, 2010). Despite the fact that Physics has made a significant contribution to life in today's society, a decline in performance has been registered over the years (W.A.E.C., 2016). Though Physics syllabus has constantly been revised with a view to make it more appealing to the students, performance in the subject has not improved (Achalla, 2001). Improvement in Mathematics performance is likely to attract higher performance in Physics and for this to happen, government, proprietors and administrators need to provide a conducive environment, which includes providing for resources and innovative teachers (Achalla, 2001, Lyons, 2005 & Nderitu, 2007). Performance in Physics may also be linked to gender (Mekonnen, 2014).

Gender refers to social or cultural construction that assigns role attitude and values considered appropriate for each sex (Nwagu, 2005). Males and females are biologically different although all cultures interpret and elaborate their biologically inherent differences into a set of social expectations about what behaviours and activities are appropriate for them and what rights, resources and even power they possess (Okeke, 2000).

In Nigeria, gender gaps occur in treatment of males and females, which put females in a corner that has deterred their progress and achievement in schools (Okeke,

2000). Nworgu (2005) & Ukwungwu (2002) discovered that either gender disparity as it exist in the schools on the part of the student or the teacher has great influence on student performance. The interactions, which may be direct or indirect, have a lot of influence on the students' performance (Okoye, 2009). Research done by Gisela (2011) on students' academic achievement shows that parent, peers and the society all influence the performance of male and female students. Zhaoyao (2002) stresses further that, how students are encouraged or discouraged to succeed in particular subjects, the expectations placed on them and learning opportunities they are presented with contribute to gender achievement gaps in schools. Okoye (2009) noted that male students tend to receive more encouragement in Mathematics and Science courses, while female students are nurtured more in reading and arts. The author further asserted that parents often inadvertently practice gender biases, which influence their performance. Gender-bias behaviour usually surfaces early in a child's life where parents tend to buy their sons and not their daughters toys and books that are related to Mathematics and Sciences (Okoye 2009). The author went further to say that educators are also strong influential factors in determining motivation for their students. Mekonnen (2014) found that many teachers unknowingly call on male students more often than female students to answer questions and give them more complex problem to solve, which create a competitive learning environment where men tend to thrive. All these seemingly influence the students' sense of accomplishment and performance in school. Adeyegbe (2002) claims that male's are more superior to females in Physics activities. Ezeudu (2008) observes a significant difference between males and females performance in Mathematics in favour of the girls. Thus, Halpern and Diane (2011) found that Science is free from gender bias. These indicate that gender, as a factor of students' performance in mathematics and physics is not conclusive. Thus, this study explored gender influence in students' performance in Mathematics and Physics in WASSCE results in Nsukka L.G.A. of Enugu State.

Research Questions

The following research questions guided the study:

1. What is the relationship between students' performance in Mathematics and Physics in WASSCE?
2. What is the moderating influence of gender on the relationship between students' performance in Mathematics and Physics in WASSCE?

Research Hypotheses

The following null hypotheses were tested at 5% probability level:

H₀₁: There is no significant relationship between students' performance in Mathematics and Physics in WASSCE.

H₀₂: There is no significant moderating influence of gender on the relationship between students' performance in Mathematics and Physics in WASSCE.

Methodology

The study adopted correlation survey design. The targeted population for the study was Senior Secondary III (SS III) Mathematics and Physics students of public secondary schools in Nsukka Local Government Area, Enugu State of Nigeria. The population of the study was students in all public Secondary Schools in Nsukka Local Government Area. A total of 1060 Mathematics and Physics Students were used as sample for the study which consist of 611 males and 449 females. Students' Academic Performance in Mathematics and Physics Proforma was used for data collection. Data collected were analyzed using Pearson' Product Moment Correlation and simple linear regression analysis.

Results

The results were presented in line with the research questions and hypotheses that guided the study.

Research Question One: What is the relationship between students' performance in Mathematics and Physics in WASSCE?

Table 1: Pearson's Product Moment Correlation Analysis of the Relationship between Students' Performance in Mathematics and Physics in WASSCE

Subject		Mathematics	Physics
Mathematics	Pearson's Correlation	1	.576**
	Sig. (2-tailed)		.000
	N	1060	1060
Physics	Pearson's Correlation	.576**	1
	Sig. (2-tailed)	.000	
	N	1060	1060

** . Correlation is significant at the 0.05 level (2-tailed).

Table 1 shows that the correlation coefficient between the students' performance in Mathematics and Physics in WASSCE is 0.576. This implies that there is a moderate positive relationship between students' performance in Mathematics and Physics in WASSCE.

H₀₁: *There is no significant relationship between students' performance in Mathematics and Physics in WASSCE.*

Table 1 shows the associated probability for the calculated r (0.576) for the relationship between students' performance in Mathematics and Physics in WASSCE is 0.000. Since the associated probability value is less than the 0.05 level of significance, the null

hypothesis was rejected. Thus, there is a significant positive relationship between students' performance in Mathematics and Physics in WASSCE.

Research Question Two: What is the moderating influence of gender on the relationship between students' performance in Mathematics and Physics in WASSCE?

Table 2: t-test Analysis of Difference in the Moderating Influence of Gender on the Relationship between Students' Performance in Mathematics and Physics in WASSCE

Gender	N	R	R ²	B	t-cal	Sig.(2-tailed)
Male	611	.644	.415	38	20.787	.000
Female	449	.256	.065			

Table 2 reveals that the correlation coefficient between male students' performance in Mathematics and Physics in WASSCE is 0.644 with coefficient of determination of 0.415 while correlation coefficient between female students' performance in Mathematics and Physics in WASSCE is 0.256 with coefficient of determination of 0.065. This implies that 41.5 percent variation in male students' performance can be attributed to the variation in their performance in Mathematics while 6.5 percent variation in female students' performance can be attributed to the variation in their performance in Mathematics.

H₀₂: *There is no significant moderating influence of gender on the relationship between students' performance in Mathematics and Physics in WASSCE.*

Table 2 shows that the calculated value of t (20.787) for the moderating influence of gender on the relationship between students' performance in Mathematics and Physics in WASSCE had an associated probability of 0.000. Since the associated probability is less than the 0.05 level of significance, the null hypothesis was rejected meaning that there is a significant moderating influence of gender on the relationship between students' performance in Mathematics and Physics in WASSCE in favour of the male students.

Discussion of Findings and Educational Implication

The results of the study showed that there is a significant positive relationship between students' performance in Mathematics and Physics in WASSCE. This result is not surprising since Mathematics has been found to play major roles in the learning of Physics. Physics by its nature is mathematical and thus demands good knowledge of Mathematics for any student to excel. Many science subjects require mathematical ideas (or principles) and detailed knowledge of Mathematics is needed to analyze the data obtained. Mathematics being a logical body of knowledge creates way for arriving at

accurate results. In line with this result, Okeke and Anapua (2010) found that Mathematics is generally accepted as a subject which plays significant roles in the learning of Science subjects especially Physics. In other words, Mathematics is indispensable in the learning of Physics.

It was equally found that there is a significant moderating influence of gender on the relationship between students' performance in Mathematics and Physics in WASSCE in favour of the male students. In line with this result, Etukudo (2001) found that male students performed significantly better than the female students did in Physics. Buttressing this result, Adeyegbe (2002) and Adetunji (2007) had similar results. Adeyegbe found that males are superior to females in Physics activities while Adetunji who worked on profile of Human and ICT resources in Mathematics with a view to ascertaining their impact on genders' learning outcome in Mathematics, found that male Mathematics students performed better than their female counterparts did. These various results have shown that there is a gender disparity in the performance of male and female students in both Physics and Mathematics in favour of male. This has serious educational implications. It implies that the female students will continue to lag on their male counterpart unless extra effort is put in place to close the gender disparity gap.

Conclusion and Recommendations

The researcher concluded that Mathematics is a prerequisite subject to the study of Physics. A student must be well grounded in Mathematics to excel in Physics. Also, there is gender disparity in the performance of students in both Mathematics and Physics in WASSCE in favour of the male counterparts. Based on these, the researcher recommended thus:

1. Good foundation should be laid in Mathematics right from primary school to enable students not to shy away from Science subjects especially Physics when they get admitted into both secondary school and tertiary levels.
2. There should equally be inter-subject coordination in planning the scheme of work in schools so that the Mathematics teachers will emphasize more on the areas of Mathematics that have general applicability in Physics.
3. Extra efforts should be put in place by both Mathematics and Physics teachers in order to bridge the gender disparity gap in Mathematics and Physics.

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