

Gender Difference in the Scholastic Achievement Test (SAT) among School Adolescents

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Abstract

The paper examined gender difference in the Scholastic Achievement Test (SAT) among senior secondary school adolescents using the physical science of physics in three (3) separate papers. The paper attempted to ascertain whether gender difference accounts for the score differential observed in the Scholastic Achievement Test (SAT). The study adopted a field experiment and a sample size of 410 respondents consisting of 208 males and 202 females respectively. The correlation matrix of the three (3) papers was performed and the two (2) hypotheses were tested with the quintessential Multivariate Analysis of Variance (MANOVA) at 0.05 level of significance. The results showed that the gap between males and females widened from one paper to the other with males performing better than females in physics. It was therefore recommended that some motivational strategies should be adopted to stir up female adolescents in physics and other physical sciences as a way of enhancing their career prospects in science-related disciplines.

Keywords: gender, Scholastic Achievement Test, adolescents, secondary school

1. Introduction

The place of gender in intellectual engagement and achievement cannot be overemphasized and it is not a new phenomenon. It has been quite obvious that every academic activity, someone is expected to emerge the best or the last. It has been investigated and observed by most researchers that female students in secondary school seem to do better than males students in verbal skills and subjects such as English language and the arts while the males do better in non-verbal skills and science subjects. Some factors often suggested as responsible for this difference include students' personality traits, intelligence quotient, gregariousness, class attendance and students' relationship with teachers.

Hence many researchers (Dawson & O'Connor, 1991; Dom & Yi, 2018; van der Vleuten Jaspers, Maas, & van der Lippe, 2016) have delved into the place of gender in students' choice of certain school subjects to determine whether performance is gender-based interestingly, many of these researchers have shown results in the direction of sex-aggregated education. In reality, what is known about gender difference comes from meta-analysis and some researchers have given reports on gender difference from investigations through meta-analysis (Batz-Barbarich, Tay, Kuykendall & Cheung, 2018; Heintz, Kramm & Ruch, 2017; Petersen, 2018; Nazareth, Huang, Voyer, & Newcombe, 2019).

1.1 Review of Related Literature

The analysis of differences in performance in school subjects based on gender has shown that the direction of differences depends on the subject under investigation. It has been demonstrated that on the Scholastic Aptitude Test (SAT), men achieve generally higher performance than women (Amin, 2000). It has also been documented that at the college level, women tend to outperform men (Kimball, 1998). An argument for this trend in college according to Ramist (1990) and Daramola (1993) is that women tend to enrol more in courses of study whose grade distributions are higher (the humanities and social sciences) than those courses for which the grade distributions tend to be lower (Engineering, mathematics and physical sciences). These courses are dominated by men. These differences are

however not constant across tasks. For instance, the level of difference in an objective test may not be the same in an essay or practical test. Peterson and Livingstone (1992) studied group differences for the College Board English composition test in Cameroon. The test includes objective and essay samples. It was found that females' average was higher than males on both the multiple-choice and free-response portions of the test, although differences were smaller for the multiple-choice portion. Klein and Hodges (2001) also studied gender difference with the California Bar Examination which includes a multiple-choice test, 6 one-hour essay questions and 2 three hours written performance problems. The result of this study shows that males perform better on the multiple-choice test but females performed better on both the essay test and written performance test. The observation that females performed better on free-response tasks is not an uncommon assumption. Sincoff and Sternberg (1988) in a paper on verbal fluency differences in school-age children reported that girls especially those above ages 11 tend to score higher than boys on verbal fluency tasks.

Daramola (1993) undertook a study on the influence of schools and sex difference of students on the knowledge of basic physics possessed by students in Kwara State. Data concerning the students who participated in the study were collected by administering a Basic Physics Test to them. The results of the study revealed that the urban students obtained a mean score which was significantly greater than that obtained by rural students. However, the male and female students mean scores on the Basic Physics Test were not significantly different. In another study, Bolger and Kellagha (1990) examined the method of measurement and gender difference in scholastic achievement. They observed in their finding that male students are more likely to perform better than their female counterparts in multiple-choice tests than in free-response tests.

Studies on the relationship between the teacher and the student revealed that it is the most important factor in teaching success (Echezona, 1992). The teacher's personality and the learning characteristics of the adolescents are somewhat inseparable lines of study for the secondary school teacher who seeks improvement.

1.2 Statement of the Problem

The problem under investigation is to determine the differences in the three processes of physics assessment (practical Essay and multiple-choice tests) in terms of their different levels of difficulty. There are differences in performance according to gender across different tasks. The review of related literature presented above guided the formulation of the following hypotheses

1.3 Hypotheses

1. Here is no significant difference between males and females performance in the physics assessment test.
2. The difference in performance in physics between male and female candidates does not significantly vary from one test to another.

2. Methods

2.1 Method of Data Collection

An experimental field method was employed in determining differences in the achievement of males and females in three (3) separate scholastic achievement tests (SAT) in Physics for Psychological Counselling

2.2 Instrument of Data Collection

Paper 1: Paper one is practical and made up of two questions. Students are required to answer any of the questions. Each question has psychomotor, cognitive and affective domains and carries a total of 25 marks. The paper 1 maximum score is 50 marks. The assessments on the psychomotor and affective domains were assessed on the spot while the cognitive aspect was done by what the students wrote.

Paper 2: Paper 2 consists of two sections. Section A had questions which measure knowledge, comprehension and application of physics concepts. It is made up of six questions that carry a total score of 30 marks. Section B had questions which measure analysis, synthesis and evaluation. Three questions were asked. Section B has a total of 30 marks. Students were required to answer the entire questions in paper 2. Paper 2 has a total of 60 marks.

Paper 3: Consists of 50 multiple-choice tests. Each question has one mark, making a total of 50 marks.

2.3 Sampling and Sampling Size

The sample consisted of 410 physics students from Ika South, Ika East, Ndokwa West, and Ukwani Local Government Areas of Delta State.

Table 1. Distribution of Students by School and by Sex

School	Male	Female	Total
Gbenoba Grammar School, Agbor	52	-	52
Mary Mount College, Owa	-	65	65
Ebologu Grammar School, Utagba-Uno	22	13	35
Utagba-Ogbe Grammar School, Utagba-Ogbe	40	35	75
I.C.E. Umutu	15	11	26
Mixed Secondary School, Umuaja	42	38	80
St. Charles Abavo	37	-	37
Baptists Girls High School, Agbor	-	40	40
	208	202	410

2.4 Method of Data Analysis

To determine the reliability of the examination, the Cronbach’s reliability coefficient alpha (α) was calculated for each of the three papers and the entire examination consisting of all the three papers, using the formula:

$$\text{Alpha } (\alpha) = \frac{(N)\text{Cov}/\text{Var}}{1+(N-1)\text{cov}/\text{var}}$$

Where N = Number of items on the test.

Cov. = average covariance between the items

Var. = average variance of the items.

To examine the differential performance of students on the 1+ (N- 1) three papers, the total for each of the three papers (1, 2 and 3) was computed by adding the marks for each of those papers and converting the total to a percentage. The means of papers 1, 2 and 3 were calculated.

To test the two hypotheses, a repeated measure multivariate analysis of Variance was computed with sex constituting the between-subjects factor while the papers (papers 1, 2 and 3) were the within-subjects factor at = 0.05.

The Cronbach reliability coefficient alpha was calculated and found to be 0.85 for paper 1, 0.59 for paper 2, 0.69 for paper 3 and 0.88 for the three papers taken as one scale. When interpreted as the squared correction between the scores a person obtained on a particular scale and the score he would have obtained if questioned on all possible items, then we see that the Cronbach alpha coefficients calculated above are quite high. These three papers of the assessment can be considered to be family reliable. The mean and standard deviation by paper and by sex are presented in Table 2.

Table 2. Distribution of Means by Paper or by Sex

Paper	Population		Male		Female	
	Means	SD	Means	SD	Means	SD
1	50.9	17.7	52.3	17.5	46.7	17.1
2	60.6	19.5	62.5	18.6	55.0	27.1
3	55.9	18.0	58.1	29.6	49.6	17.1

3. Results

Hypothesis 1: There is no significant difference between males and females performance in the physics assessment test.

The result of hypothesis 1 is presented in table 3.

Table 3. Test of Significant Difference between Subjects (Sex) Effect.

	SS	df	MS	F	Sig. F
Within Cells	468300.6	408	857.69		
Constant	1426869.9	1	166361	166361	0.000
Sex	15820.4	1	15820.4	18.45	0.000

An examination of Table 3 shows that males consistently performed better than females on all three papers requiring different types of tasks. Hypothesis one is therefore rejected, which implies that a significant difference exists between males and females performance in the physics assessment test.

Hypothesis 2: The difference in performance in physics between male and female candidates does not significantly vary from one test to another.

The result of hypothesis 2 is presented in Table 4.

Table 4. Two-way ANOVA for Testing Interaction Effects

Source of Variation	SS	DF	MS	F	Sig. F
Within Cells	72271.16	1092	66.18		
Paper	17614.14	2	8807.1	133.1	0.000
Sex by Paper Interaction	468.38	2	234.1	3.5	0.029

The interaction terms shown in table 4 is significant and hypothesis two is therefore rejected. This implies that the difference between means for males and females vary from paper to paper.

4. Discussion

This study examined gender difference in the Scholastic Achievement Test (SAT) among school adolescents. The objective of the paper is to ascertain whether differences observed in the performance of students in SAT is due to their gender difference. The result of the analysis conducted showed that a significant difference exists between males and females performance in the physics assessment test. This implies that the difference observed in the performance of the students is accounted for by their gender difference. This finding confirms the result of several studies (Amin, 2000; Kimball, 1998; Peterson & Livingstone, 1992). These studies found significant gender differences in various subject areas.

The current study also found out that the difference between means for males and females vary from paper to paper. This finding has shown that the differences observed in the performance of male and female students can be moderated by the type of paper used. This finding is in line with the observation of Bolger and Kellaghan (1990), who found out that the performance of male and female students can vary as a function of the method of measurement used.

5. Conclusion and Recommendations

The gap between male and female performance widened from paper one through three, perhaps for the reason that applied to mathematics being inherent in physics (Amin, 2000). The results showed that the candidates found paper one more difficult while paper two was less difficult. Although the males generally performed better than the females, the difference between their performances was not constant across the different tasks. In other words, interaction effects were found significant.

Based on the above findings and conclusion, it is recommended that further motivational strategies and instructional techniques should be employed in enhancing the performance of the female folks in Physics and other physical sciences for their career uplift.

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