

# **Sex Differences and Academic Performance in Mathematics – Based Students’ Disciplines in Colleges of Education in Osun State, Nigeria**

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## **Abstract:**

There has been incessant low academic performance in Mathematics especially among female in colleges of education for some time. Thus, this study sought to find the sex differences and academic performance in Mathematics-based students’ disciplines in Colleges of Education in Ilesa and Ila Orangun, both in Osun State, Nigeria. The research adopted pre-test post-test control group quasi experimental design. The study comprised of six mathematics combinations at the 300 level of Schools of Science and Arts & Social sciences in the two government owned Colleges of Education, Osun State. 130 students were sampled for the study. The two instruments used for data collection were Mathematics Performance Test and Mathematics Attitudinal Scale. The hypotheses generated were tested using t-test analysis. The study revealed that there was no visible difference between the attitude of male and female students while there was a significant difference in the performance of male and female students when exposed to instructional aids. The outcome of the study is expected to influence policy, decision making and other stakeholders on female students’ better performance in the subject. It is recommended that lecturers should intensify efforts to encourage female students not minding the sex and give them equal opportunities in the class room in order to build their confidence in the subject.

**Keywords:** Academic, Differences, Mathematics-Based, Performance, Sex, Students,

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## Introduction

Over the years, gender differences in academic performance in Mathematics have been an issue of controversy and have generated considerable interest in the field of educational research. Also many educated women in the society have made this issue of gender equity in education a serious concern. Despite several action plans made by government in the past, the problem still persists. Thus, this issue of gender differences may therefore be caused by an interaction of factors that could be within and outside the school as well as by the learners' background.

Long ago, numerous determinant factors of academic performance have been revealed by researchers, among which are school entry modalities (Cameson & Wilson, 2011; Olayemi, 2009), gender continuous assessment (Owolabi & Etuk-Iren, 2009), learning disabilities (Shupe & Yager, 2011), socio-economic status (Ajayi & Muraina, 2011) and teaching methods (Eniayeju, 2010). One of the properties that distinguish organism on the basis of their reproductive roles as male or female according to Abubarka and Uboh (2010) is gender. Therefore, the term 'gender' according to Ewumi (2012), involves the psychological and socio-cultural dimensions of being male and female. According to Ajai (2018), a number of literature exist in reporting attempts to explain gender differences in Mathematics and cognitive performance. For instance, it was declared by Colom and Lynn (2004) that males have larger average brain sizes than females, and so would be expected to have higher average intelligent quotient (IQ) than the female. Also, scholars such as Bryner (2007), Breda and Ly (2012) asserted that mathematics is a male dominated subject. In the study of Hydea and Mertz (2009), gender parity in performance in Mathematics was revealed.

In his research, Ajai (2018) reported that the second southern and eastern Africa consortium for monitoring education quality (SACMEQ) survey by international institute for educational planning (UNESCO, 2004) revealed no significant gender differences among students in South Africa. However, females significantly performed better than their male counterparts in the same study in Seycheles. Interestingly, in the same study, the male students performed better than the females in Tanzania, Kenya, Malawi, Mozambique and Zambia. This shows that there is fluctuating performance in Mathematics between male and female students. Thus, gender had only minor impacts on educational achievement according to Newman-Ford, et al. (2009).

Findings of most scholars indicate that females were affected negatively. For example, study done by Devine, et al (2012) has revealed that students from secondary school experience anxiety in mathematics. According to them, girls showed higher of mathematics anxiety than boys and that high levels of Mathematics anxiety were related to poorer levels of performance in Mathematics. Also Else-Quest, et al. (2010) emphatically declared that regardless of the overall similarities in mathematics skills, male students felt significantly more confident than female students in their abilities and in addition, more motivated to do well. In addition, books and curriculum materials at times, discourages girls from learning efficaciously and restricts their career choices (Kagume, 2010). However, the idea that both males and females have equal mathematical ability was widely accepted amongst scholars in the field of social science (Hyde, 2010).

The Nigeria socialization patterns and some other African countries that places more restrictions and a higher input of daily domestics labour on the female than male indirectly schemes female out from any consideration for serious professional discipline, even when the females appears to be more brilliant than their male counterparts (Alordiah, et al., 2015). As a



way of reducing the disparity in performance, certain efforts have been made by different groups, among which is women professional in Forum for African Women Educationists (FAWE) who were supporting girl child education financially (FAWE, 2008).

This study calls for various combination of courses. Thus, subject combination is crucial for candidate seeking to pursue academic career after completing secondary school education. National policy on education (FGN, 2013) thus classified subject groupings at the senior secondary school level into four as follows: humanities, science and mathematics, technology and business studies, having general mathematics as one of the cross-cutting subjects.

### Methodology

The research adopted pre-test post-test control group quasi-experimental design. The population for this study is all the students offering mathematics course at the Colleges of Education in Ilesa and Ila Orangun both of which are in Osun State. The combinations are: Economics / Mathematics, Geography / Mathematics, Physics / Mathematics, Mathematics / Chemistry, Computer science/ Mathematics and Integrated science / Mathematics. The sample for this study consisted of all the 300 level mathematics students purposively selected from the two government owned Colleges of Education in Osun State, Nigeria. In all, a total number of 130 students were involved in all the course combinations. The instruments used for this study were the Mathematics Performance Test (MPT) and Mathematics Attitudinal Scale (MAS). The MPT was a 25-item instrument used to access the level of acquisition of concepts in the colleges of education by the same students. It was also a multiple choice test with four alternatives where students were expected to pick only one. The MAS was a 20-items instrument used to determine/measure the interest of students to mathematics. It was a 4-point Likert rating scale type ranging from Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD). The instruments were validated and their reliability determined before they were used to collect the data meant for this study.

### Results

**Hypothesis 1:** There is no significant difference in the attitude of male and female students in Mathematics.

**Table 1: t-test summary for male and female attitude in Mathematics**

<i>Sex</i>	<i>N</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>df</i>	<i>t-cal</i>	<i>Sig. (2-tailed)</i>
Male	58	3.97	0.898	128	-1.951	0.053
Female	72	4.25	0.765			

Table 1 shows that male students recorded an attitude mean score of 3.97 while female students had a mean of 4.25.  $t_{cal}(128) = 1.951$ , and  $p > 0.05$ . Hence, null hypothesis that there is no significant difference in the attitude of male and female students in Mathematics is not rejected. Therefore, there is no significant difference in the attitude of male and female students in Mathematics.

**Hypothesis 2:** There is no significant difference in the mean scores of male and female students in the Mathematics Performance Test (MPT) pre test group.

**Table 2: t-test summary on pre-test mean scores of male and female students in Mathematics Performance Test (MPT)**

Sex	N	Mean	Std. Deviation	df	t <sub>-cal</sub>	Sig. (2-tailed)
Male	58	9.14	2.749	128	0.027	0.979
Female	72	9.15	3.455			

Table 2 reveals that male students recorded mean score of 9.14 while female students had a mean of 9.15.  $t_{cal}(128) = 0.027$ , and  $p > 0.05$ . Hence, null hypothesis that there is no significant difference in the mean scores of male and female students pre-test MPT was not rejected. Therefore, there is no significant difference in the mean scores of male and female students in the Mathematics Performance Test (MPT) pre-test group.

**Hypothesis 3:** There is no significant difference in the mean scores of male and female students in MPT post-test group.

**Table 3: t-test summary on the post-test mean scores of male and female students in MPT**

Sex	N	Mean	Std. Deviation	df	t <sub>-cal</sub>	Sig. (2-tailed)
Male	58	13.03	3.929	128	0.050	0.960
Female	72	13.00	3.929			

Table 3 reveals that male students recorded mean score 13.03 while female students had a mean of 13.00.  $t_{cal}(128) = 0.050$  and  $p > 0.05$ . Hence, the null hypothesis that there is no significant difference in the mean scores of male and female students post-test MPT was not rejected. Therefore, there is no significant difference in the mean scores of male and female students in MPT post-test group.

**Hypothesis 4:** There is no significant difference in the mean scores of male and female students in the pre-test and post-test of students' mathematics performance.

**Table 4: t-test summary on the pre-test and post-test mean scores of male and female students in MPT**

Group	N	Mean	Std. Deviation	df	t <sub>-cal</sub>	Sig. (2-tailed)
<i>Pre-test scores</i>	130	9.15	3.148	129	-12.408	0.000
<i>Post-test scores</i>	130	13.02	3.914			

Table 4 shows the mean scores of male and female students in the pre-test and post-test of MPT. The mean pre-test score for MPT was 9.15, while the mean post test score was 13.02. These data were subjected to the t-test for paired samples with the results showing a statistically significant at  $t_{cal}(129) = 12.408$ , and  $p < 0.05$ . Hence, null hypothesis that there is no significant difference in the mean scores of male and female students in the pre-test and post-test of students' MPT is rejected. Consequently, it can be deduced that the mean score of the students was appreciative after the post-test exercise.

### Discussion of findings

The findings of this study initially showed that there was no visible difference between the attitude as well as academic performance of male and female students. This is in consonance with the findings of Else-Quest, et al (2010). Their findings concerning the two Landmark studies, Trends in International Mathematics and Science Study (TIMSS) and Programme for International Student Assessment (PISA) showed that males and females had shown to be substantially equal in mathematics achievement. Their result showed that mathematics performance of females measured up to their male counterpart.

However, at the later stage, the result was appreciated where there was improvement in the students' academic performance. There was a clear significant difference between male and female whereby male students performed better than their female counterparts. This coincided with Mbugua's (2012) study who found that boys performed better than girls in Science, Mathematics and Technology subjects. The assertion of Hughes-Isley (2015) is not different as he concluded that male students performed better than females in their academic performance. It was noticed that the study time among female students is reduced as they perform domestic duties. Corroborating this, Dimbisso (2009) found that female students have heavy burdens of domestic work that could resort to unclear minds, inadequate time for assignments, increased fatigue and lack of commitment to college activities. In the same vein, Omeng and Nasango (2010) asserted that a close link occurs between participation of female students during lessons and their low academic performance because of their involvement in domestic chores. What could be deduced from this is that too much involvement in domestic chores by female college students reduce their participation during classes and make them compromise their academic performance.

### Conclusion and Recommendations

The findings of this study revealed that there was no significant difference in the attitude and performance of male and female students in Mathematics whereas there was a significant difference of male and female students in mathematics performance at the post test level. The fact that attitude of students as a variable is not statistically significant is an indication that it might not be responsible for male students performing better than their female counterparts in Mathematics. The findings of this study also revealed that there was a significant difference in the performance of male and female students when exposed to instructional aids. With this, certain areas that need to be looked into in order to enhance the learning performance of students in Mathematics were exposed. Thus, gender sensitive learning will aid effective mathematics learning if the government and other stakeholders in education industry could take action on this. Also, researchers and mathematics educators/lecturers should intensify efforts to encourage female students not minding the sex and give them equal opportunities in the classroom in order to build their confidence in the subject.

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