GENDER DIFFERENCE AND PERFORMANCE OF SECONDARY SCHOOL STUDENTS IN MATHEMATICS

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Abstract: The study investigated gender difference in Mathematics. 220 SS III students from four mixed schools in Akure North Local Government Area of Ondo State were selected based on stratified random sampling technique. The instrument for collecting data was a 40-item multiple choice Mathematics Achievement Test drawn from the concept of number and numeration, and validated by the researcher. The internal consistency of the instrument was estimated at 0.65 using KR 21 and administered using research assistants. Data were analysed using means, standard deviations and test, tested at 0.05 level of significance. Results showed no gender difference in Mathematics performance both in the urban and rural areas though performances of males and females in the rural areas were below average. It was recommended that Mathematics teachers should regularly test students on the various mathematical concepts and feedback provided to prepare them for credible performance in Mathematics at internal and existence examinations.

Keywords: gender difference, performance, students, Mathematics

INTRODUCTION

One specific issue which has generated much debate in educational circles over the years is the question of whether differential cognitive ability exists or does not exist between male and female students in a defined learning task. A definite answer to this question seems to be a complex one. The complexity arises because both the empirical and theoretical literature have produced diverse and contradictory results. While some studies (e.g. Jegede and Inyang, 1990; Kotte, 1992; Harpen, 2000) indicated that male students perform better than female students in many areas of science, some also (e.g. Brandon, Newton and Hammond, 1987; Jules and Kuttick, 1990; Virginia, 2005; Walt, 2005) claimed that female students outperform male students in sciences while some also (e.g. Daramola, 1992; Oladunni, 1995) reported no gender difference in academic ability.

In Mathematics education, for example, a wealth of research has examined gender difference in Mathematics performance with a view of reducing gender inequity both at school and during working life as well as encouraging both sexes to develop interest in Mathematics so as to meet the challenges of modern science and technology worldwide (Brusselmans-Dehairs and Henry, 1994; Nurudeen, 2010). Much of the earlier studies (e.g. Maccoby and Jacklin, 1974) has reported that males have better Mathematics and visuospatial skills than females. Subsequently, Maccoby (1987) maintained that males still have superior skills in Mathematics and visuospatials than the females.
However, Stage, Kreinbery, Eccles and Becker (1985) having reviewed extensive literature in gender difference and Mathematics performance, drew three conflicting conclusions: first, that high school boys performed a little better than high school girls on test of Mathematics reasoning involving word problems; second, that boys and girls performed equally on tests of algebra and basic mathematical knowledge; and third, that girls occasionally outperformed boys on tests of computational skills.

Meanwhile, Hyde (1993) and Hyde and Mezulis (2001) believed that the cognitive differences between males and females have been exaggerated. Indeed, Hyde (1993) pointed out that there is considerable overlap in the distribution of male and female scores on Mathematics and visuospatial tasks. However, Drura-Roush (1994) cited specific domain where gender differences existed in Mathematics, pointing out that girls seem to outperform boys in computational tasks and do less well on problem-solving whereas boys outperform girls on spatial tasks. Similarly, the report of the research on the Third International Mathematics and Science Study (Tims, 1999; Fierros, 1999) showed that males do better than females in Mathematics and science generally though in certain areas such as life science and certain types of mathematical problems, females perform better than males. Also, in a national study by United States Department of Education (2000), it was reported that males did slightly better than females at Mathematics and science whereas in overall assessment, females showed superiority earning better grades and they were significantly better in reading.

In an analysis of the Delaware Student Testing Programme and the Standard Achievement Test Series (9th edition) for students in 3rd, 5th, 8th and 10th grades, Zhang and Manon (2000) reported that males had a larger variance in Mathematics scores than females. Moreover, females tended to outperform males among the low-achieving students while males tended to outperform females among the high achieving students. In a similar but earlier meta-study, Hedges and Novell (1995) reported that males are more likely than females to be found at the tail ends of a given intelligent-testbell-curve and that as one approaches the ends of the tails, the effect becomes larger and at several standard deviations above and below the mean, the ratio of individuals with identical scores tend to be one female to every five males. Intrigued by Hedges and Novell (1995)’s findings, Summers and Rogers (2007) concluded that the differences in standard deviations for male and female cognitive traits might account for differences in high-powered science job in favour of males.

Meanwhile, Fisher (2008) having examined various data—including Scholastic Aptitude Test (SAT) results and Mathematics scores from 7-million students who were tested in accordance with the “No Child Left Behind Act” concluded that no gender difference existed in performance. In contrast, the analysis of the results of the examination conducted by the West African Examinations Council (WAEC) in Nigeria in May/June 2008, Uwadiae (2008) published that out of about 13.8% of the candidates who had credits and above in Mathematics and English Language plus three other subjects, 7.32% were males while 6.43% were females signifying that the males performed slightly better than the females. The foregoing seems to make it increasingly clear that the long-smouldering debate on gender difference in Mathematics is inconclusive and widely open to further investigation. Consequently, the question emerges again, does gender difference in Mathematics performance exist?

**PURPOSE OF THE STUDY**

The purpose of this was to find out whether gender difference in Mathematics performance existed among secondary school students in Akure North Local Government Area of Ondo State and to determine whether school location would influence gender difference in Mathematics performance.

**RESEARCH QUESTIONS**

The following research questions were raised to guide the study:

1. Is there any difference between performance of male and female students in Mathematics?
2. Will school location influence performance of male and female students in Mathematics?
RESEARCH HYPOTHESES

The following hypotheses were tested at 0.05 level of significance

HO₁: There is no significant difference between performance of male and female students in Mathematics.

HO₂: School location will not significantly influence performance of male and female students in Mathematics.

METHODOLOGY

Research Design

The study was a survey design in order to describe the performance of male and female students in Mathematics.

Sample and Sampling Technique

220 SSIII students from four mixed schools in Akure North Local Government Area of Ondo State were selected for the study based on stratified random sampling technique. The strata recognised the school location (urban=2, rural=2) and gender (male=110, female=110).

Research Instrument

The instrument for collecting data was a 40-item multiple choice Mathematics Achievement Test (MAT) drawn from the concept of number and numeration (number bases, fractions, decimals and approximation, indices, logarithms, sequence, sets, logical reasoning, positive and negative integers, rational numbers, surds, ratio, proportion and rates, variations and percentages), based on four levels of cognitive—knowledge, understanding, application and analysis using a table of specification. The difficulty indices of items ranged from 0.30 to 0.85 while discriminating indices ranged from 0.40 to 0.90 using 27% upper and lower classes (Tetrachoric-α). The internal consistency of the instrument was estimated at 0.65 using Kuder-Richardson -21.

Sample items include:

1. Which of the following numbers represents the largest number?
   (a) 11010₂twelve (b) 100₂three (c) 10₅five (d) 3₁eight (e) 2₁₂twelve

2. Given that \( \log₂A = 3 \) and \( \log₃B = 2 \), then A+B is
   (a) 5 (b) 6 (c) 10 (d) 12 (e) 17

3. In a certain club, every member owns either a Toyota Camry or a Jeep. 18 have Toyota Camry while 25 have Jeeps and 8 have both. How many members are in the club?
   (a) 244 (b) 51 (c) 43 (d) 35 (e) 26

4. If \( n \) is an integer and \( \frac{n + 5}{2} \) is also an integer, then \( n \) could be
   (a) Any odd integer (b) Any even integer (c) Any positive integer
   (d) Any negative integer (e) Any multiple of 5

The time allowed was 1 hour

Data Collection and Analysis

Data were collected using research assistants and analysed using means, standard deviations and t-test, tested at 0.05 level of significance.
RESULTS

HO1: There is no significant difference between performance of male and female students in Mathematics

Data were analysed using means, standard deviations and t-test comparison as presented in table 1.

<table>
<thead>
<tr>
<th>Variables</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>df</th>
<th>t_cal</th>
<th>t_tab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>110</td>
<td>19.5</td>
<td>4.7</td>
<td></td>
<td>0.610</td>
<td>1.96</td>
</tr>
<tr>
<td>Female</td>
<td>110</td>
<td>19.1</td>
<td>5.1</td>
<td>218</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

P>0.05 (not significant)

Table 1 shows that the mean scores of males and females in Mathematics were 19.5 and 19.1 with standard deviations 4.7 and 5.1 respectively. The t-test calculated was 0.61 while t-table=1.96 at 0.05 level of significance. Since t_cal<t_tab, it implies that no significant difference existed between males and females in Mathematics.

HO2: School location will not significantly influence performance of male and female students in Mathematics

Data were analysed using means, standard deviations and t-test comparison as presented in table 2.

<table>
<thead>
<tr>
<th>Location</th>
<th>Variables</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>df</th>
<th>t_cal</th>
<th>t_tab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>Male</td>
<td>60</td>
<td>20.8</td>
<td>4.89</td>
<td>118</td>
<td>0.441</td>
<td>2.00</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>60</td>
<td>21.2</td>
<td>5.05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>Male</td>
<td>50</td>
<td>17.9</td>
<td>3.87</td>
<td>98</td>
<td>1.56</td>
<td>2.00</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>50</td>
<td>16.7</td>
<td>3.83</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2 shows that the mean scores of males and females in Mathematics in urban areas were 20.8 and 21.2 with standard deviations 4.89 and 5.05 respectively. The t_cal=0.441 while t_table=2.00 at 0.05 level of significance. Since t_cal<t_table, it implies that no significant difference existed between performance of males and females in Mathematics in the urban areas. Similarly, the mean scores of males and females in Mathematics in the rural areas were 17.9 and 16.7 with standard deviations 3.87 and 3.83 respectively. The t_cal=1.56 while t_table=2.00. Since t_cal<t_table, it implies that no significant difference existed between males and females in Mathematics in the rural areas.

DISCUSSION

The central goal of this study was to find out whether gender difference in Mathematics performance existed among secondary school students. The results in table 1 showed that no such difference existed as t_calculated was not significant. Moreover, the mean scores of males, 19.5 (49%) and females, 19.1 (48%) were similar in terms of marginal performance as the mean scores were below average of 20 (50%). However, the spread of scores for males and females showed no significant difference as male scores ranged from 15 (37.5%) to 24 (60%) and females from 14 (35%) to 24 (60%). The similarity in performance of male and female students in Mathematics is not surprising because the sample for the study was drawn from the same local government area and more so, the four schools were co-educational signifying similar exposure to learning experiences in Mathematics. These results concur with the

The result in table 2 showed no significant difference between performance of males and females in Mathematics both in urban and rural areas as calculated in both cases were less than the table value at 0.05 level of significance. However, a reexamination of table 2 showed that both males and females in the urban areas had the mean scores higher than the average with 20.8 (52%) and 21.2 (53%) respectively, and the range of scores 15.9 (39.8%) to 25.7 (64%) and 16.2 (40.4%) to 26.2 (65.6%) respectively. By inspection, the females in urban area performed slightly better in Mathematics than their male counterpart. This result supports Ivowi (1995) that females are not inferior to males in intellectual capability. Moreover, Virginia (2005) noted that girls sometimes perform better than boys for similar Mathematics test as demonstrated in this study. However, the performance of males and females in the rural areas, though showed no significant difference, were below average as the mean scores of males was 17.9 (44%) and females 16.7 (42%). Further, the range of scores for males spread from 14 (35%) to 21.8 (54.4%) while females’ ranged from 12.9 (32%) to 20.5 (51.3%). By inspection, the males in the rural areas performed better in Mathematics than their female counterparts which shows that school location had slight influence on performance of male and female students in Mathematics though males and females in urban areas performed better than males and females in the rural areas.

CONCLUSION

It could be concluded in this study that gender difference in Mathematics performance did not exist though the similarity in performance of males and females in Mathematics in the rural areas fell below average.

RECOMMENDATIONS

Based on the findings of this study, it was recommended that:

1. Mathematics teachers in Akure North Local Government Area of Ondo State should regularly test the students on various mathematical concepts and provide feedback so as to prepare them for credible performance in internal and external examinations.

2. Male and female students in the rural areas should be encouraged to develop Mathematics ability and consider the subject worth passing so as to meet the challenges of the modern technology such as computer and internal facilities.

REFERENCES


