Gender Disparity in Mathematics Achievement: A Reality or A Counterfeit?

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Introduction

In particular with reference to mathematics education it is seen that issues related to gender and mathematics are complex. A vast literature concerning gender differences favouring males in mathematics has arisen over the past several decades in academic, practitioner and public policy fields. The enquiry covers differences in cognitive ability, school achievement, achievement in standardized tests, attitudes, motivation, participation course-taking and so on. When research on gender gaps in mathematics is disseminated and discussed in the popular press, subtle and not-so-subtle variations in measurement, design and reporting are lost and the result is a bewildering constellation of facts and hypotheses through which non-experts must navigate. Are there in fact differences? Differences in what, and what are the consequences of such differences?

In the broadest terms, some basic facts have been more or less established in the research of the last two decades on gender differences in mathematics. Gender differences favouring boys in mathematics tend not to appear until high school—in earlier grades, differences are either non-existent or favour girls (Hyde et. al. 1990, Randhawa, 1991; Han & Hoover, 1994; Ma, 1999a). They tend to appear in standardized tests rather than school grades and tend to be highest among the best performing students (Becker & Forsyth, 1990; Han & Hoover, 1994; Hedges & Nowell, 1995; Lawson et. al., 1999;Lauzon, 1999). The gaps tend also to be declining with time (Friedman, 1989; Lawson et. al., 1999, Stanley & Stumpf, 1997 McClure 1998) though this may be less true of advanced mathematics achievement and upper-level course-taking patterns (Benbow, 1988, Johnson, 2000). Observed gaps tend to be small relative to differences between other population groups—i.e., gaps are larger within genders than between genders (Lawson et. al.. 1999).

In spite of research evidences for male's superiority in math achievement, some research findings do not support the difference between two genders in math achievement. As an example, Sprigler & Alsup (2003) refer to researcher indications that shown no gender difference on the mathematical reasoning ability at elementary level. Finding from longitudinal study about gender differences in mathematics show that there is no difference among boys and girls in mathematics achievement. (Ding, Song and Richardson; 2007). According to a recent international study conducted by IEA, on average across all countries, there was essentially no difference in achievement between boys and girls at either the eighth or fourth grade (Mullis et al., 2004). Finding of two recent consecutive International studies (TIMSS 1999 &2003) in Iranian educational system (a system that co-education is prohibited and female teachers teach in the girls' schools and male teachers teach in the boys' schools) also confirms that there is no significant differences between boys and girls in mathematics achievement. Data from these studies show the significant decrease in the boys' mathematics achievement score from the time of TIMSS 1999 and the significant improvement in the girls' achievement over the same period. Teacher job satisfaction and the positive perspective of female teachers regarding teaching of mathematics may be the factors behind the better mathematics performance of Iranian girls than boys at Grade 8 in Iran (Kiamanesh, 2006).

The importance of the study of gender differences arises as the extremely important educational problem. Gender equality, including education, is a condition for development and awareness of the gender dimension and action to promote gender equality has grown at the instructional level. Indeed, after decades of intense debate, the world has reached consensus that no country's development can be judged satisfactory if woman do not fully participate in community life, in society and in work. The investigator feels an urge to study gender differences of the students in achievement, particularly in the subject of mathematics, which is considered to be a key factor for the development of science and technology as well as for the growth of a nation.

Objectives of the Study

1. To study the level of achievement of elementary school children in Mathematics.
2. To study the gender differences in Mathematics Achievement.

Hypothesis

1. There is no significant difference between male and female students in their achievement in mathematics.

Methodology and Design of the Study

Method, Sample and Population: In the present study the researcher had adopted a descriptive method of survey. The investigator tried to study the gender differences in mathematics achievement of elementary school students in Aligarh district. Therefore, the population of the present study includes all the students studying at elementary school level in the district Aligarh of the state Uttar Pradesh (India).

The investigator selected four schools affiliated to C.B.S.E. Board. The sample of 211 elementary school students was selected by using simple random sampling technique. Out of these 104 were males and 107 were females. The detail is given below:

Table 1
School-Wise Distribution of the Sample-Subjects

S.No.	Schools	Male	Female	Total
1	S.T.S High School	52	-	52
2	Abdullah Girls High School	-	50	50
3	Iqra Public School	-	48	48
4	Aligarh Public School	52	9	61

	Total	104	107	211
	Grand Total	211		

Tools Used

Mid-Term Achievement Survey (2007): Mid-Term Achievement Survey (2007) was developed by NCERT. This test measures the mathematics achievement of the students. This tool consists of 60 mathematics multiple choice items and the time allotted for the completion of the test was 120 minutes. Maximum marks of the test were 60 and there was no pass and fail in the test. The test was developed and standardized on 7th class students.

Statistical Techniques Used

To check the normality of the distribution of scores, descriptive statistics namely distribution of frequencies, mean, standard deviation, skewness and kurtosis were worked out for the scores of mathematics achievement of male, female and total sample. The investigator also employed t-test in order to find out the significant differences between the two means of males and females for mathematics achievement. The investigator also calculated confidence intervals for estimation of population mean.

Analysis and Interpretation

Objective 1: To study the level of achievement of elementary school children in Mathematics.

Table 2
Distribution of Scores on Achievement in Mathematics

Mathematics Achievement	Female Students	Male Students	Total
6-9	0	1	1
10-13	4	5	9
14-17	13	11	24
18-21	19	16	35
22-25	27	13	40
26-29	12	13	25
30-33	15	17	32
34-37	7	16	23
38-41	4	7	11
42-45	5	3	8
46-49	1	2	3

Figure 1
Graphical Representation of Distribution of Mathematics Achievement Scores
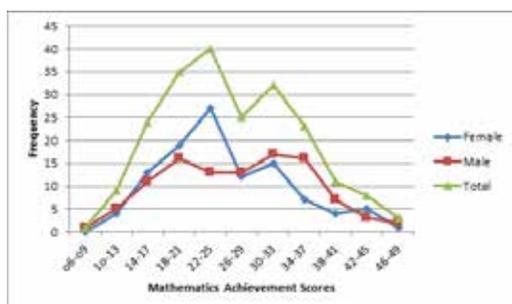
Table
3.Descriptive Statistics of Achievement Scores

Descriptive Statistics	Male	Female	Total
N	104	107	211
Mean	27.02	25.42	26.21
Standard Deviation	8.723	7.968	8.367
Standard Error of Mean	.855	.770	.576
Skewness	.140	.573	.351
Standard Error of Skewness	.237	.234	.167
Kurtosis	-.713	-.238	-.566
Standard Error of Kurtosis	.469	.463	.333

Table 3. Reveals that the mean scores on mathematics achievement for the total sample (both male and female) were found to be 26.21 with a standard deviation of 8.37 and a standard error of 0.576 points. The investigator also attempted to estimate the population mean in terms of confidence intervals and found that 99% confidence interval for population mean for the total samples ranged from 25.08 to 27.34, which means that probability is 0.99 that the true mean of the population for the total sample would lie within these limits. From the table, the value of skewness of the curve for total sample was .351, which is positive; therefore the curve is inclined more to the right. The value of kurtosis was -.566, which indicated that the distribution is slightly leptokurtic.

Also, Table 3 indicates the mean scores on mathematics achievement for male students to be 27.02 with a standard deviation of 8.72 and a standard error of .855 points. The estimated range of the population mean in terms of 99% confidence interval was, from 24.81 to 29.23.Thus, indicating 0.99 probabilities that the true mean of the population for male students would lie within these limits. Table 3 also revealed the value of skewness of the distribution curve for male students to be .140 and value of kurtosis as -.713.

Similarly, again from Table 3, the mean scores on mathematics achievement for female students were found to be 25.42 with a standard deviation 7.97 and a standard error of 0.770 points. The true mean score of the population for female students in terms of 99% confidence interval was estimated to be ranging from 24.72 to 27.41. The table also indicated the values of skewness and kurtosis for the distribution of female students as .573 and -.238 points respectively.

Thus, very minor divergences were observed in the various measures of scores from those of normal distribution but these were not significant enough to be taken as real discrepancies and could safely be attributed to sampling fluctuations. Hence, the data were normally distributed. This is also confirmed by the figure 1 showing distribution of achievement scores.

Objective 2: To study the gender difference Mathematics Achievement.

Hypothesis 1: There is no significant difference between male and female students in their Achievement in Mathematics.

Table 5
Comparing Achievement of Male and Female Students

Mathematics Achievement	N	Mean	Standard Deviation	df	t-value	Significance
Female	107	25.42	7.968		1.391 NS	.166 NS
Male	104	27.02	8.723	209		

Table 5. Shows that mean mathematics achievement scores of male and female students were 27.02 and 25.42 with S.D's 8.72 and 7.97 respectively. Value of 't' obtained by calculation is .914. From the t-table, it can be concluded that the critical value of t for 200 degree of freedom at 0.05 level and 0.01 level of significance are 1.97 and 2.60. Here it can be easily seen that calculated value of t is less than the critical values of t. Therefore, it is clearly shown that there is no significant difference in mathematics achievement of male and female elementary school children at .05 level of significance. In the present study gender was not found to be an important factor influencing the math achievement of students. Similar results were found by Beaton et al., (1996) and Mullis et al., (1997).

Hence, the hypothesis that there is no significant difference between male and female elementary school children in their mathematics achievement is accepted.

Conclusion and Suggestions:
The findings show no gender difference in mathematics achievement of elementary school children. There are various implications that can be inferred from the findings of the present study.

- Gender issues in education being a part of broader goal of gender equality should thus be addressed appropriately.
- Considering the importance of mathematics education as an important tool in nation building, emphasis should be given to building up awareness of this subject among all the students and parents through guidance and counseling.
- Equal opportunity to pursue this subject should be given to both boys and girls, especially at elementary school level. A strong elementary school mathematics foundation cannot be overlooked to fulfill the necessary mathematics requirements at high school and college level.
- In light of this, the work of elementary school teacher is extraordinarily important. Well trained teachers must be involved.
- Male and female students should make the competitive environment, coordinate and exchange their knowledge from one another in mathematics teaching and learning. Girls students should be informed the importance of mathematics and it is the basic tool for further education.
- Mathematics teaching and evaluation strategies should be bias-free. This way, males and females will tend to see themselves as equals.
- Creating an encouraging and conducive environment at school and running remedial classes for low achievers in mathematics would definitely do some good to raise the achievement of students in mathematics.

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