# High Achievement in Mathematics and the Girl Child

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## Introduction

Who are better in respect of achievement in mathematics? Boys or girls?

In fact, it has been found from the results of public examinations at the secondary and post secondary stages that the average performances of boys and girls in mathematics are more or less the same in different years. Some investigators, however, have found that boys are superior, while others have seen the superiority of girls. The mean differences between the performances of boys and girls in mathematics have been found, in many cases, not to be significant.

All the answers to the question posed above are of the following types : i) boys are better than girls, ii) girls are better than boys iii) there is no significant difference between the performances of boys and girls. Each of the above conclusions has it's own interpretations.

## The problem

Let us now concentrate our attention to the performances of high achievers in mathematics. The following observations may be noted : i) In the list of renowned world mathematicians, the number of woman mathematicians is quite less. ii) In mathematics based subjects, (e.g. engineering and technology), the number of girls in less. iii) In the topper lists of H.S. Examination (Science Group), the number of girl children is less in comparison to that of boys. The above observations led to the conclusion that the performances of girls are always less than those of boys at the top level.

## Objectives

Under the above context, the author intended to investigate the position of girls in respect of high achievement in mathematics. It is also aimed to collect and accumulate the reflections of different kinds of mathematics-people about such achievements of the girl child.

## Experiences from the results of Achievement-cum-Diagnostic Test (ADTM)

Achievement-cum-Diagnostic test is organised by Centre for Pedagogical Studies in Mathematics, a reputed organisation, every year to ascertain the potentialities and diagnose the weakness of students ranging from class IV to class XII, since last fifteen years. Every year a large number of students participate in the test. The number of participant students ranges from 35 thousand to 55 thousand every year. About ten to fifteen students of each class (IV to XII), who top the list of students of each class are selected and rewarded. It has been found that about 35% of the participating students are girls. The number boys and girls in the toppers' list in different classes and in different years been found out and given in the Table 1. It may be pointed out that about 30% of the students come from urban area and the rest 70% of students are from semi urban and rural area.

## Analysis

The table of toppers' list clearly shows that these girl children are less in number as compared to the boys. It is true that the total number of girl participants was about 35% to the total number of participating candidates. The proportion of number of boys and that of girls is 2:1 (approx.) but the proportion of the number of more-able boys and more-able girls is 9:1. The candidates of the test are both from rural, urban and semi-urban areas in proportion 2:1(approx.). The number of more able boys and girls has been found to be more in urban areas than that of the same in rural areas.

Totally speaking, it appears that, among the high-achievers, the number of girl children is less than that of boy children.

The present investigation can not claim that such generalisation is true in all cases. The results, however, indicate that, for some reason or the other, girl-children are not holding top-positions in greater numbers, particularly, in rural and disadvantaged areas.

## Two case studies

It is necessary to investigate reasons for such low number of girl toppers and ascertain the causes of relatively poor achievement. First of all, it is necessary to know, what the students, teachers and administrators are thinking about this.

| Year | The number of Toppers in different classes from IV - XII | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IV | | V | | VI | | VII | | VIII | | IX | | X | | XI | | XII | | Total | | Grand Total |
| | Boys | Girls | Boys | Girls | Boys | Girls | Boys | Girls | Boys | Girls | Boys | Girls | Boys | Girls | Boys | Girls | Boys | Girls | Boys | Girls | |
| 1996 | 13 | 4 | 12 | 0 | 12 | 4 | 12 | 3 | 17 | 0 | 13 | 0 | 12 | 0 | 3 | 0 | 2 | 0 | 96 | 11 | 107 |
| 1997 | 19 | 5 | 11 | 1 | 9 | 2 | 8 | 1 | 12 | 0 | 12 | 1 | 8 | 4 | 2 | 0 | 2 | 0 | 83 | 14 | 97 |
| 1998 | 14 | 1 | 11 | 3 | 11 | 1 | 7 | 1 | 10 | 0 | 9 | 0 | 9 | 1 | 3 | 0 | 2 | 1 | 76 | 8 | 83 |
| 1999 | 12 | 0 | 12 | 1 | 10 | 2 | 11 | 0 | 10 | 1 | 9 | 0 | 9 | 0 | 2 | 0 | 3 | 0 | 78 | 4 | 82 |
| 2000 | 10 | 1 | 10 | 2 | 11 | 1 | 11 | 1 | 11 | 3 | 11 | 0 | 5 | 1 | 2 | 0 | 2 | 0 | 75 | 9 | 84 |
| 2001 | 7 | 1 | 7 | 1 | 7 | 1 | 6 | 2 | 8 | 0 | 9 | 1 | 7 | 0 | 3 | 0 | 3 | 0 | 57 | 6 | 63 |
| 2002 | 12 | 0 | 9 | 3 | 9 | 1 | 8 | 2 | 10 | 2 | 15 | 1 | 9 | 0 | 8 | 0 | 3 | 0 | 83 | 9 | 95 |
| 2003 | 9 | 4 | 12 | 0 | 11 | 0 | 10 | 0 | 11 | 2 | 9 | 1 | 12 | 0 | 9 | 0 | 7 | 0 | 90 | 7 | 97 |
| Total | 96 | 16 | 84 | 11 | 80 | 12 | 73 | 10 | 89 | 8 | 87 | 4 | 71 | 6 | 32 | 0 | 24 | 1 | 63 | 68 | 704 |

*Table 1: Number of toppers in Achievement-cum-Diagnostic Test in 1996 – 2003.*

The following steps were undertaken.

i) An instant talk competition was arranged by the author, 12 students of class XI, and each one from twelve schools of which six were from Boys' and other six from girls' schools of Kolkata. Each student was asked to talk on the topic, " Why are the girls weak in mathematics?" The boys and girls gave relevant arguments in support of their answers. The responses revealed a lot of ideas in regard to so called weakness of girls in mathematics.

ii) A second step was taken. Twenty experts of whom ten are males and ten are females were selected. The experts were teacher-educators, teachers of mathematics from schools and colleges, and educational administrators. All of them were participants of a seminar on mathematics teaching organised by Centre for Pedagogical Studies in Mathematics. Each of the twenty participants were asked to state reasons on the issue 'Why is the number of girls less than that of boys among the high achievers in mathematics?' The group of experts took the issue enthusiastically and gave their opinions and comments regarding such achievement of girls.

### Why is the number less?

The opinions expressed in the talk competition by the students, both boys and the girls were collected. Again the opinions and comments expressed by the experts were also taken into account. Finally a list was prepared, which according to the above respondents were reasons for low achievement of girls. These reasons were many, diverse and varied. It is to be noted that these reasons are not exhaustive. They, however, give a glimpse of what learners as well as experts think about such low achievement of girls.

### Reasons for low achievement of the girl child

An analysis of the opinions of learners of experts revealed the following:

i) Most of the male experts opined that majority of the girl children are 'naturally' weak in mathematics and in mathematical reasoning, while most of the female experts did not agree to such a comment.

ii) The guardians do not usually encourage the study of mathematics for their daughters.

iii) The guardians normally think at the very beginning that the girl children are poor in mathematics.

iv) The girl children have lesser interest, attitude and attention in mathematical thinking.

v) In the matrimonial market the would-be-husbands and their parents prefer that the prospective bride should be conversant in fine arts (dance, music, drawing etc.) and the humanities, rather than in mathematics, science and engineering.

vi) In rural areas, the negligence of the guardians and the society of the girl child in their study of mathematics and science is highly discouraging.

vii) The girls have to do household work in addition to their study.

viii) The girls are prohibited from going outside and discussing the lessons with their boy friends, and male tutors and teachers.

ix) The experts agreed that there are many bright girl children also, who are learning mathematics with joy and enthusiasm in a better way than many of their boy classmates.

x) The expert group also opined that, given proper opportunity and encouragement, the girl child can excel in the same way as the boys.

xi) According to them it is encouraging that the girl children are doing better now as compared to earlier days.

xii) The number of girl students in a particular sample is less and hence the number of high achiever girls is less.

xiii) Boys are more efficient in 'hall manage' than the girls and hence boys get greater score in mathematics than girls.

**Observations and their interpretations**

First of all, it is to be admitted that the observation obtained from the results of ADTM for boys and girls are confined only to the population taken in the study. Thus, the observation that the number of girls is less than that of the girls in respect of high achievement in mathematics can not taken as a generalised conclusion. In fact, we often find many bright girl students who are shining in future as eminent mathematicians. But many facts, figures and findings as stated in our paper earlier, show that the number of girl-toppers is less than that of the boy-toppers in regard to achievement in mathematics.

Some opinions for this underachievement of girl child have been given above. It is to be carefully examined to what extent they can be accepted as valid reasons for under achievement of the girl child. It has been seen that 'bright' girl students in mathematics are less in rural areas than in urban areas.

It can thus be said that as socio-cultural conditions improve, the consciousness of gender equality also improves, and as such, the girl child gets greater motivation to do better.

Another significant finding is that such bright girl students are less in upper grades than in lower grades.

At lower secondary stages the boys and girls get, to some extent, equal educational opportunity. But, at upper secondary and higher secondary stages, the attention of guardians are focussed more on boys than girls. Again the parent also takes greater attention to see that their daughters take up humanities subjects rather than science subjects. Thus the issue of such under achievement ultimately reduces to social neglect of the girl child. In fact, in many cases, parents give more attention to boys, because they think that boys will get jobs and will help the family in future, so they select the boy child for study of science and mathematics, and provide maximum possible facilities to them. The whole atmosphere of learning mathematics for the girl child is in most cases not congenial for mathematical study. Again, the would-be-husbands and his family members prefer the bride to be conversant in fine arts, music, dance, cooking, humanities etc. rather than being engaged in the study of mathematics.

Let us consider the simulation in the classroom also in co-education classes, the teacher has in many cases the pre-occupied idea that boys are superior to girls, and so asks more questions to boys and lesser number of questions to the girls. The girls, on the other hand, being naturally shy and timid, do not intend to respond properly. The spontaneous intention of learning is thus thwarted. Being deprived of encouragement from parents, teachers, boy friends, family members and the society, the girl child herself starts thinking that she is inferior to the boy child in the study of higher mathematics.

It must, however be admitted that the above gloomy situation of learning mathematics is not always true. But, in most cases, the under-achievement of the girl child in mathematics, in case of occupying top-positions, is due to the negative attitude of gender-difference to the girl child by the school, family and the society.