Gender Disparity In Mathematics Anxiety And Phobia Among The Students Of Higher Secondary Schools

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Abstract

Mathematics education is facing a typical problem due to anxiety and phobia of the students. Various studies show that Gender of the students is a significant factor of anxiety in mathematics. This paper is an attempt to compare between boys and girls of higher secondary schools in mathematics anxiety and phobia. To carry out this study, 184 boys and 184 girl students of Purba Bardhaman district of West Bengal were selected by adopting proper method of sampling to compare the relationship among the students over the gender in the degrees of anxiety & phobia in Mathematics. Data were analyzed by appropriate method with inferential statistics. It was observed from the findings that the boys & girls do not differ significantly in their anxiety & phobia in mathematics. The results lead to conclude that boys and girls are having similar degrees of anxiety in mathematics, though the trend of anxiety indicates that the girls are little more anxious than boys in mathematics. Moreover it was found that the effects of different strategies on the achievement of boys and girls in mathematics do not differ significantly. However, the achievement of boys and girls treated through **Strategy-1** (Guided Concept Attainment) were significantly better than the achievement of boys and girls treated through **Strategy-2** (Programmed Instruction).

Index Terms - Mathematics, Gender, Anxiety & phobia, Achievement .

INTRODUCTION

Development of human resources and its maximum utilization are necessary for steady progress of civilization. Indian society is changing very rapidly due to the advancement of science and technology, computer and internet system. The healthy Socio-Economic growth of society also depends to a great extent upon the effectiveness of education. In the rapid changing scenario, the aims of science education have been considered from wider perspective to fulfil the individual, social and national needs. Mathematics education is the most serious and essential area of concern in science education among school children. According to 'The National Focus Group' on the teaching of mathematics, "the main aim of mathematics education in school is the mathematization of child's thought process".

It is fact that mathematics education is facing a typical problem due to anxiety and phobia of students in the subject. A large number of students avoid mathematics as science subject in their higher secondary curriculum due to the anxiety and phobia in mathematics. *Harper & Daane* (1998) viewed those intellectual factors like learning style, persistence, self-doubt etc. create anxiety in mathematics. *Fotoples* (2000) found the personality factors; such as low self-esteem, shyness and intimidation are responsible agent for developing anxiety in mathematics among students. Gender of the students is widely mentioned as a significant factor of anxiety in mathematics. *Kumar & Karimi* (2010) found that there is a significant gender difference of anxiety in mathematics, but no significant difference exists between boys and girls in terms of mathematics performance and academic performance. Various study mentioned that females are more anxious in mathematics than males with some contradictory findings. Therefore, Anxiety and Phobia in mathematics is very pertinent area in the field of educational research, especially in mathematics education.

According to the dictionary of psychology, anxiety is defined as painful uneasiness of mind concerning impending and anticipated ill. Anxiety in mathematics has been defined by *Tobias* (1993) as feelings of tension and anxiety that interface with the manipulation of numbers and solving mathematical problems in a wide variety of ordinary life and academic situations. *Gresham* (2004) defined, anxiety in mathematics as the lack of applied understanding and/or irrational dread of mathematics often leading to avoidance of the subject.

Rapalje (1997) described Phobia in mathematics as an intense, persistent, often, illogical, fear of not succeeding in mathematics. Persons experiencing math phobia hold a belief that they are unable to handle the difficulty associated with learning math or beliefs that they can't do the math. According to the New Oxford Dictionary (2000), "The phobia is generally used to denote fear disliking, antipathy". Keeping the above in view the present study has been conducted on the issue of anxiety and phobia in mathematics among the students of higher secondary schools on gender variation.

OBJECTIVES OF THE STUDY

1. To compare the degree of anxiety and phobia between boys and girls of higher secondary schools.

2. To find out the significant relationship between anxiety and the achievement of students in mathematics.

3. To find out the effects of strategies on the achievements in mathematics with reference to gender differences.

HYPOTHESIS

H01**: The degrees of anxiety and phobia in mathematics between boys and girls differ significantly.**

- Treatment design: χ^2 (chi-square)

Level of Anxiety

Gender	Extremely anxious	Highly anxious	Moderately anxious	Low anxious	Not at all anxious
Boys	x	x	x	x	x
Girls	x	x	x	x	x

Expected Outcome: χ^2 is significant.

H02**: The effect of strategies on learning and anxiety of boys and girls in mathematics differ significantly.**

(a) Treatment design: "t" (Critical ratio)
(To compare the achievements of boys and girls within strategies)

Level of Achievement

Gender	Mean (post-instruction)
Boys	M1
Girls	M2

Expected outcome: "t" between M1 & M2 differ significantly.

(b) Treatment design: "t" (Critical ratio)
(To compare the achievements of boys and girls between strategies)

Level of Achievement

Strategy	Gender	Mean
Strategy-1	Boys	M3
		M5
Strategy-2	Girls	M4
		M6

Expected outcome: "t" between Strategy-1 & Strategy-2 for boys & girls do not differ significantly.

(c) Treatment design: χ^2 (Chi-square)
(To compare anxiety of boys and girls within strategy)

Level of Anxiety

Gender	Extremely anxious	High anxious	Medium anxious	Low anxious	Non-anxious
Boys	X	X	X	X	X
Girls	X	X	X	X	X

Expected Outcome: χ^2 between boys & girls differs significantly.

(d) Treatment design: χ^2 (Chi-square)
(To compare anxiety of boys and girls between strategies)

Level of Anxiety

Strategy	Gender	High anxious	Medium anxious	Low anxious	Non-anxious
Strategy-1	Boys	X	X	X	X
Strategy-2		X	X	X	X
Strategy-1	Girls	X	X	X	X
Strategy-2		X	X	X	X

Expected Outcome: (i) χ^2 between Strategy-1 & Strategy-2 for boys do not differ significantly

(ii) χ^2 between Strategy-1 & Strategy-2 do not differ significantly for girls.

SAMPLE

As sample 368 students was selected randomly of which 184 boys & 184 girls. After selecting students, they were instructed through two different strategies.

METHODOLOGY

Two different strategies were adopted to conduct the experiment on the contents of mathematics for minimizing anxiety and phobia among the students of higher secondary schools in mathematics. The selected strategies were (i) Group interacting strategies and (ii) Programmed learning.

The experiment was conducted on the students of class-XI of the selected schools. Data were collected after conducting the experiments.

ANALYSIS OF DATA

1. Analysis of Data pertaining to H01

[H01: There is a significant relationship between anxiety and the achievement of students in mathematics]

Table- 1

Showing the distribution of boys and girls students based on their anxiety

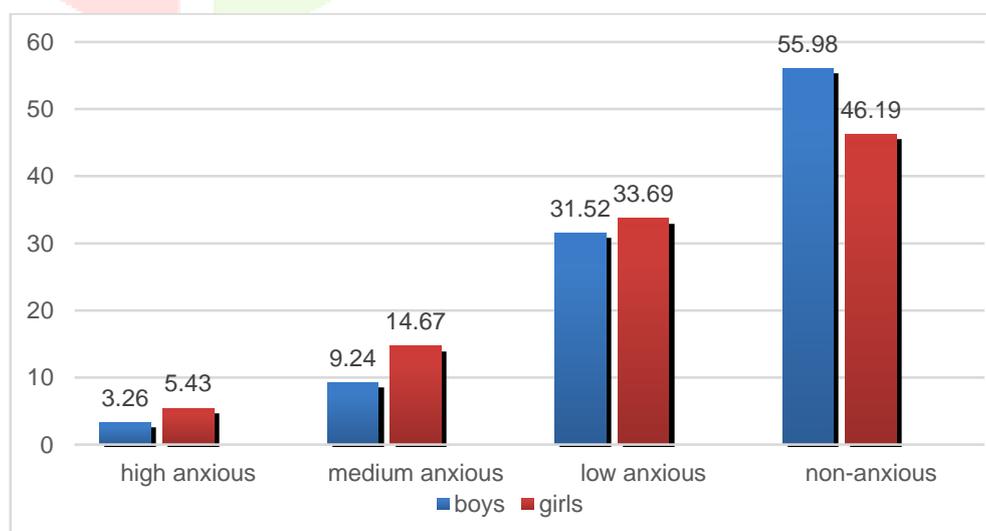| Category	Boys		Girl	
	N	Percentage	N	Percentage
EA	0	0	0	0
HA	6	3.26	10	5.43
MA	17	9.24	27	14.67
LA	58	31.52	62	33.69
NA	103	55.98	85	46.19
Total	184	100.00	184	100.00

Figure 1

Interpretation: Percentage of boys belonging to high anxious, medium anxious, low anxious and non-anxious categories are *3.26, 9.24, 31.52* and *55.98* respectively. For girls, it is *5.43, 14.67, 33.69* and *46.19* respectively. Therefore, the trend of anxiety indicates that the girls are more anxious than boys in mathematics. The above graph also showing the comparison of anxiety between boys and girls among different anxious category.

Table- 2

Showing the distribution & relation between boys and girls students based on their anxiety

Sex	Extremely anxious	Highly anxious	Moderately anxious	Low anxious	Not at all anxious	χ^2 value	Level of significance
Boys	0	6	17	58	103	5.06	NS
Girls	0	10	27	62	85		

χ^2 value is not significant at *0.05* level, meaning thereby boys and girls do not differ significantly in the degree of anxiety and phobia in mathematics. Hence H01 is retained.

1.1 Systematization analysis of data to test the homogeneity of groups for experimentation

Table- 3

Showing the homogeneity of pair of groups based on entry level anxiety

Groups	N	Mean	S.D.	F-value	Level of significance
A_1	45	63.18	8.34	1.18	Not significant
A_2	45	63.14	9.08		
B_1	45	56.43	18.11	1.56	Not significant
B_2	45	56.24	14.51		
C_1	45	61.80	7.56	1.43	Not significant
C_2	45	62.12	8.12		
D_1	45	57.10	9.27	1.24	Not significant
D_2	45	57.30	10.11		

Interpretation: Above table indicates the values of F on the basis of entry level anxiety test between groups. Result shows that F is not significant at *0.05* level. Meaning there by on the basis of entry level test both the groups under each school are homogeneous.

2. Analysis of Data pertaining to H02

[H02: The effects of strategy on anxiety of boys and girls in mathematics do not differ significantly]

2.1. Effects of strategies on the achievements of students in mathematics :

Table- 4

Showing the effects of strategies on the achievements in mathematics with reference to gender differences (within strategy)

[t – design]

Strategy	Gender	N	Mean	S.D.	t - value	Level of significance
Strategy-1	Boys	90	28.24	8.35	1.24	NS
	Girls	90	26.82	9.07		
Strategy-2	Boys	90	23.12	7.98	1.33	NS
	Girls	90	20.98	8.26		

Table- 5

Showing the effects of strategies on the achievements in mathematics with reference to gender difference (between strategy)

[t – design]

Strategy	Gender	N	Mean	S.D.	t - value	Level of significance
Strategy-1	Boys	90	28.24	8.35	4.49	0.01
Strategy-2		90	23.12	7.98		
Strategy-1	Girls	90	26.82	9.07	5.12	0.01
Strategy-2		90	20.98	8.26		

2.2. Effects of strategies on anxiety of students in mathematics :

Table- 6

Showing the distribution of students on the basis of their anxiety in mathematics with reference to gender (within strategy)

[χ^2 – design]

Strategy	Gender	N	High anxious	Medium anxious	Low anxious	Non-anxious	χ^2 -value	Level of significance
Strategy-1	Boys	90	1	5	16	92	4.79	NS
	Girls	90	4	6	21	55		
Strategy-2	Boys	90	3	8	27	57	2.35	NS
	Girls	90	5	9	24	47		

Table- 7

Showing the distribution of students on the basis of their anxiety in mathematics with reference to gender (between strategies)

[χ^2 – design]

Strategy	Gender	N	High anxious	Medium anxious	Low anxious	Non-anxious	χ^2 -value	Level of significance
Strategy-1	Boys	90	1	5	16	72	8.12	0.05
Strategy-2		90	3	8	27	57		
Strategy-1	Girls	90	4	6	21	55	7.82	0.05
Strategy-2		90	5	9	24	47		

Interpretation: Analysis of data has been made to compare the effects of two strategies due to the variation of gender. Results (*table- 4*) indicate that the achievement of boys and girls do not differ significantly within the strategies. However, achievements of boys and girls (*table- 5*) under two different strategies differ significantly. Results also indicate that the achievement of boys and girls treated thorough **Strategy-1** are significantly higher than that of **Strategy-2**. Thus the gain is in favour of **Strategy-1** .

In case of the effects of strategy for minimizing anxiety of boys and girls in mathematics, results (*table- 6*) indicate that the anxiety of boys and girls do not differ significantly within the strategy. But, there was a significant effect (*table- 7*) of **Strategy-1** on both boys and girls for minimizing the anxiety in mathematics than that of the **Strategy-2** . Thus the finding establishes the superiority of **Strategy-1** than **Strategy-2** for improving achievement and minimizing anxiety and phobia of the students of higher secondary schools in mathematics.

FINDINGS AND CONCLUSIONS

In regard to anxiety and phobia between boys and girls of higher secondary schools, it was observed that both the groups do not differ significantly in their overall degrees of anxiety and phobia in mathematics. However there have some discrepancies in the degrees of anxiety and phobia between boys and girls. The result indicates that girls were more anxious than boys in mathematics, although the degree of anxiety between two groups do not differ significantly.

The study was also intended to estimate the effects of strategies on gender variation in regard to achievement in mathematics. It has been observed from the results that the achievement of boys and girls (both) do not differ significantly (*table- 4*) within the strategies but there was significant difference of achievement between the strategies (*table- 5*). Results also indicate that the achievement of boys and girls treated thorough **Strategy-1** (*Guided Concept attainment*) are significantly better than that of **Strategy-2** (*Programmed Instruction*) and there was also a significant effect of **Strategy-1** on both boys and girls for minimizing the anxiety in mathematics than that of the **Strategy-2** by (*table- 7*).

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