

The Effect of Achievement, Gender and Class Room Context on School Students' Mathematical Beliefs

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The influences of achievement, gender and classroom context on students' mathematical beliefs were analyzed. In this present study the researchers adopt the descriptive survey method. All the students studying in class IX and X in secondary schools situated in Karbi Anglong district of Assam constitutes the population of the study. A sample of one thousand two hundred forty (1240) students were selected from 48 secondary and higher secondary schools of Karbi Anglong for the study. A research instrument was developed by the researchers on the basis of modified Fennema Sherman Mathematics Attitude Scale to collect data for the study. The study reveals that there exists significant differences in attitude towards mathematics, between male-female students, rural-urban school students and public-private school students. Researchers find a strong positive correlation between students' attitude towards Mathematics and their academic achievements in Mathematics.

Introduction

There has been an increased interest among the researchers to study the role of mathematical beliefs in the learning of mathematics (Schuck & Grootenboer, 2004) and Leder, 2006). Grootenboer (2003) found that positive mathematical beliefs are significantly related to increased mathematical achievements. Many researches has been conducted on the important roles of beliefs in teaching and learning of mathematics. Thompson (1992), Recharadson (1996) and Phillip (2007) are some of such researchers.

In the educational literatures we cannot find a common generalized definition of belief. The distinction between belief, conception and knowledge is not clear (Pehkonen, E. & Törner, G, 1999). According to McLead and McLead (2002) the concept of belief is a complex one. Beliefs are components of a recently developed social, psychological construct (Goldin, Epstein and Schorr, 2007). According to Green (1971) beliefs never occur as a single thing, they appear in bundles (Maass, Schlöglmann, 2009). Goldin (2003) found that beliefs are 'interwoven' into systems with other beliefs. Beliefs can be considered as "aggregates of mental states." (Goldin, Rosken, Torner, 2009). Beliefs of an individual is a complex mixture of various possible perceptions, characteristics, philosophies, suppositions and ideological states of that individual. The nature of relationship between beliefs and behaviour is important. Some researcher says that beliefs influence behaviours and on the other hand some argue vice-versa. Context is another important factor for the growth of positive beliefs towards mathematics. Hayles (1992) argued that context is useful in the development of an individual's beliefs.

Attitudes of an individual are closely related to the beliefs of that individual. Martino and Zan (2001) said in their research works "In mathematics education the words 'beliefs' and 'attitudes' are often used as synonyms." According to McLeod (1992) "In the literature it is difficult to separate research on attitudes from research on beliefs". White, Way, Perry and Southwell (2006) argued "For each belief an individual would have a corresponding attitude". In mathematical language we can say that there exists a one to one correspondence between attitudes and beliefs. Considering these views the researchers are using a research instrument developed on the basis of modified *Fennema Sherman Mathematics Attitude Scale* to collect data for the study.

Gender differences and mathematical beliefs is another area of research in recent times. In developed countries the gap between gender differences and mathematics achievements in secondary schools is gradually narrowing (Fennema and Hart 1994, Beatan et.al. 1996). But there exists clear gender differences regarding mathematical beliefs (Leder et al., 1996). Boys believe that mathematics is a male dominant area. On the other hand girls believe that mathematics is gender neutral (Forst, Hyde & Fennema, 1994). Leder (1993), Hannula (1997), found in their research that boys have higher self confidence than girls in the area of mathematics. Young explored the attitude towards mathematics and found that boys like mathematics more than girls.

Regarding the secondary schools of Karbi Anglong district of Assam, there exists significant differences between the mathematics achievements of male and female students (Ahmed and Bora, 2011). The researchers found that with students from low income families there is a big difference (12%) in mathematics achievements between male and female students of secondary schools of Karbi Anglong. In a recent study Ahmed and Bora

(2011) found that the mean scores of mathematics teachers' positive attitude towards mathematics is only 40.25, which indicates that in Karbi Anglong district of Assam mathematics teachers of secondary schools have less positive attitudes towards mathematics. The researchers also established the fact that school environment has great impact on building of students' belief towards teaching mathematics and on performances of school learners.

Hypotheses

The following null hypotheses are constructed for the study

- H1: There is no significant relationship between achievement and students attitude towards mathematics.
- H2: There is no significant relationship between gender and students attitude towards mathematics.
- H3: There is no significant relationship between school environment (rural and urban) and students' attitude towards mathematics.
- H4: There is no significant relationship between class volume and students' attitude towards mathematics.

Methodology

In this present study the researchers adopt the descriptive survey method. All the students studying in class IX and X in secondary schools situated in Karbi Anglong district of Assam constitutes the population of the study. A sample of one thousand two hundred forty (1240) students was selected from 48 secondary and higher secondary schools of Karbi Anglong for the study. A research instrument has been developed by the researchers on the basis of modified Fennema Sherman Mathematics Attitude Scale to collect data for the study. The study investigates the difference in attitudes of school students towards Mathematics by gender, proprietorship of school and environment of school.

Urban	Rural
24	24

Table 1. Distribution of schools

Gender		Class Volume		School Environment	
Male	Female	<50	>50	Urban	Rural
700	540	620	620	620	620

Table 2. Distribution of respondents (Students)

Research Instrument

To examine the effect of achievement, gender and classroom context on attitude towards mathematics the researchers developed a research instrument. *Students' Attitude Towards Mathematics Scale* (SATMS). This scale was developed on the basis of Fennema Sherman Mathematics Attitude Scale. SATMS consists of two sections. Name, gender, community, category of the student were asked in the section A. The name of the school was also included in that section. Section B consists of 30 questions, 15 of them were positively worded and 15 of them are negatively worded. The SATMS was designed to investigate the underlying dimensions of attitudes towards mathematics. Items were constructed to assess confidence, anxiety, value, enjoyment, motivation and parent-teacher expectations. In each dimension 6 questions are asked. Students are expected to answer the questions by expressing their level of agreement as five point scale of strongly Agree(A), Agree(B), Neutral(C), Disagree(D), Strongly Disagree(E). A pilot survey was done with SATMS on 30 students in Diphu area. Cronbach Alfa coefficient was computed to determine the reliability and the value obtained was 0.71. SATMS is prepared having five levels of expressions for each item. Weights assigned to each level are as the following table.

Level of Response	Scores	
	Positive items	Negative Items
Strongly Agree(A)	5	1
Agree(B)	4	2
Neutral(C)	3	3
Disagree(D)	2	4
Strongly Disagree(E)	1	5

Table 3. Weights assigned to different levels

For SATMS the possible score ranges from 30 to 150 .

Data Analysis and Interpretation:

Collected data are tabulated and Mean, standard deviation and t-test are applied to analyse data.

SI No	Statistical Measure	Boys	Girls	<50	>50	Urban	Rural	Total
1	Total Score	1250	651	1725	1443	1195	706	1901
2	Mean	50.19	23.76	44.3	40.09	46.5	29.4	40.25
3	S.D.	12.34	8.25	10.2	11.4	16.08	13	14.63
4	No of schools	-	-	24	24	24	24	48

Table 4. Students' Attitude Responses.

SI No	Statistical Measure	Boy	Girl	<50	>50	Urban	Rural	Total
1	Student Appeared	620	620	620	620	620	620	1240
2	Student Passed	409	211	321	299	381	145	526
3	Passed %	65.97	34.03	51.78	48.22	61.45	23.38	42.41
4	Mean	17.04	8.79	13.38	12.46	15.88	6.04	11
5	S.D.	5.3	2.5	3.1	3.9	3.76	4.50	6.82

Table 5. Students' Academic Achievements in mathematics

The mean score of students' attitude towards mathematics is 51.25 out of 150. This indicates that secondary school students studying in Karbi Anglong district of Assam possess only 34.17% positive attitude towards mathematics which is very low. Male student's attitude responses ($\bar{x}=50.19, \sigma=15.02$) are higher than that of female students ($\bar{x}=23.76, \sigma=10.34$). Attitude Responses of students are higher in urban areas ($\bar{x}=46.5, \sigma=16.08$) than in rural areas ($\bar{x}=29.4, \sigma=13$). Regarding class volume, there is no significant difference between class having less than 50 students ($\bar{x}=37.25, \sigma=9.23$) and classes having more than 50 students ($\bar{x}=35.3, \sigma=10.15$). The calculated t- value for students' mathematics achievement and students' attitude towards mathematics is 4.78 which is much higher than the tabulated value 1.96. Therefore the null hypothesis H1 is rejected i.e there exist a significant relationship between achievement and students attitude towards mathematics. The calculated t- value for gender and students' attitude towards mathematics is 4.22 which is much higher than the tabulated value 2.069. Therefore the null hypothesis H2 is rejected i.e there exist significant relationship between gender and students attitude towards mathematics. The calculated t- value for school environment (Rural or Urban) and students' attitude towards mathematics is 4.22 which is much higher than the tabulated value 1.96. Therefore the null hypothesis H3 is rejected i.e there exist significant relationship between school environment (rural and urban) and students' attitude towards mathematics. The calculated t-value for class volume and students' attitude towards mathematics is 1.85 which is smaller than the tabulated value 1.96. Therefore, the null hypothesis H4 may be rejected i.e there is no significant relationship between class volume and students' attitude towards mathematics.

Discussion and Conclusion:

In this study the researcher sought to investigate the relationship between academic achievements of students in mathematics and belief on mathematics i.e attitude of students' towards mathematics; relationship between gender and attitude of students' towards mathematics; relationship between classroom context (school environment and class volume) and attitude of students' towards mathematics. Results from the study show that mean score of students' belief or attitude towards Mathematics is only 40.25 out of maximum score 150, which indicates that students have low positive attitude towards Mathematics. Achievements in mathematics and gender have good effect on students attitude towards the subject. School environment has also significant impact on belief building but class volume has no contribution on students' belief regarding mathematics.

Further study may be carried out to find out the reasons of students' low positive attitude towards mathematics in this ST dominated region of India. The present study reveals that there exist a strong correlation between students' attitude towards mathematics and students' academic achievements in mathematics. Moreover, this study reveals that school environment has a great effect on students' attitude towards mathematics and their performances in mathematics.

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