Full Length Research Paper

Co-relational study on anxiety and achievement in mathematics of secondary school students’ in Jangal-Mahal of West-Bengal, India

*¹Monoranjan Bhowmik, ²Bharati Banerjee (Roy)

¹Vidyasagar Teachers’ Training College, Paschim Medinipur, Pin – 721101, West-Bengal, India. ²Department of Education, Rabindra Bharati University, Kolkata-700050, West-Bengal, India.

*Corresponding author email: Email-mbvttc@gmail.com

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ABSTRACT

The purpose of this study was to investigate Jangal Mahals’ (West-Bengal, India) high school students’ anxiety towards mathematics and achievement in mathematics. For this purpose, the methodology employed in this study was a descriptive type. The participants of this study consisted of 394 secondary (class ten) students from six different high schools. The mathematics anxiety scale and mathematics achievement questioner developed and standardized by the authors. The data was quantitatively analysed by using independent samples t-tests and Pearson’s correlation coefficient using SPSS software. Findings showed that in gender difference there is no significant difference on the students’ anxiety towards mathematics, though there is not so significant difference in achievement in mathematics. Also there is a significant negative correlation between anxiety towards mathematics and achievement in mathematics.

Keywords: Mathematics, Anxiety, Academic achievement, Gender.

INTRODUCTION

Mathematics anxiety has become an object of research attention for nowadays. It is distinct from general anxiety and in particular from test anxiety. Mathematics anxiety describes the states of mind developed through personal experience and individual emotional responses to these experiences. According to Sheffield and Hunt (2007), mathematics anxiety in many ways is easy to describe and define. It is the feelings of anxiety that some individuals experience when facing mathematical problems. Like other form of anxiety, students may feel their heart beat more quickly or strongly and they may believe they are not capable of completing mathematical problems or they may avoid attempting mathematics courses.

Mathematics anxiety is known as such disable condition when students faces struggle with mathematics. This condition is a real fear of mathematics that causes students to have an urge to avoid mathematics completely (Oxford and Vordick, 2006). Mathematics anxiety can occur in all levels of education from primary school to higher education and once established it can persist in daily life, interfering with all activities involving numeracy and in higher studies of mathematics. Mathematics anxiety usually comes from negative experiences in working with teachers, tutors, classmates, parents or siblings (Yenilmez et al., 2007); Barnes (2006)
stated that mathematics anxiety could be caused by a number of things: unpleasant past experiences in the mathematics classroom, guardian conveying the information to their children that mathematics is boring, tough and useless or from the negative attitudes of the teachers themselves. Parental involvement and a parents’ role in changing attitudes toward mathematics and removing anxiety towards mathematics are important. Parents need to take a proactive role in the education of their children (Furner and Berman, 2003).

Supportive parents contribute to the success of their children while unsupportive ones add to the academic problems (Silva et al., 2006). Parents should talk with their children about their anxieties. They should discuss the feelings that the child associates with mathematics and try to pin point when the children started to experience these feelings (Rossnan, 2006); Oxford and Vordick (2006) stated that there are many more influences that are believed to help cause mathematics anxiety. The teacher’s attitude is a major factor since students may not know the causes of learning mathematics that the teacher seems uninterested in or uncomfortable with. McNaught (2007) indicated that good teachers are able to create a learning environment in which students have high and positive expectations about their learning, co-operative behaviour is pronounced and the culture encourages learning to occur. Rossnan (2006) suggested that teachers and parents should work together to assure every students that learning mathematics is important, relevant and fun so that they can learn the mathematics skills that they need to succeed. Shields (2006) had tested seven teaching strategies in the contribution to mathematics anxiety. All of them were significantly related with mathematics anxiety. The strategies were individual competitive mathematics activities, independent mathematics work, being taught in large and small group, working with a partner in mathematics activities, social interactions which included talking and discussion in mathematics class and being a member of a team in competitive mathematics activities. Oxford and Vordick (2006) suggested that there were many causes of mathematics anxiety and the causes appeared to stem from an instructor’s methods of teaching. Barnes (2006) reported that students made several suggestions as to how to reduce mathematics anxiety. They felt that teachers should teach students study habits, raise students’ confidence in their mathematical abilities, walk around the classroom to help students and answer questions and for teachers to provide more hands on activities during mathematics class. According to study by lossi (2007), strategies for minimizing anxiety include curricular strategies, such as retesting, self-paced learning, distance education, single-sex classes, and mathematics anxiety courses. Then, instructional strategies could also be used such as manipulative, technology, self-regulation techniques, and communication. In addition, reducing anxiety also included non-instructional strategies, such as relaxation therapy and psychological treatment. Although solutions to anxiety are not guaranteed, it may help for teachers to incorporate greater structure into the lesson plans, and encourage an interactive classroom that will stimulate questions, and where students will feel comfortable (Oxford and Vordick, 2006). Also (Bhowmik and Banerjee, 2012) studied over this region regarding attitude of the students towards mathematics.

The aim of this research is to find out the secondary students’ anxiety towards mathematics in some selected secondary schools of Jangal Mahal, West-Bengal, India. The research will focuses on finding the students’ anxiety towards mathematics, achievement in mathematics and also finding the significant relation between students’ anxiety towards mathematics and achievement in mathematics with regard to gender of the students.

RESEARCH METHODOLOGY

Research questions

This study aimed to investigate the high school students’ achievement in mathematics and anxiety towards mathematics in terms of their gender difference. Also the correlation between achievements and anxieties in mathematics of the secondary students. The literature have revealed that few studies investigating students’ anxiety, achievement in mathematics levels towards mathematics and achievement in mathematics according to gender, school type and class level have been conducted. Therefore, the answers to the following research questions are sought:

1. What are the levels of students’ achievement in mathematics of the secondary students with regard to gender?
2. What are the students’ anxieties towards mathematics of the secondary students’ with regard to gender?
3. Are there exists any relationships between anxieties towards mathematics and achievement in mathematics of the secondary students’ with regard to gender?

Hypotheses of the study

To find out the considerable response in respect of above quarrries researchers used the following null hypothesis.

H01: There is no significant difference between mean achievements in mathematics of boys and girls of the secondary students.

H02: There is no significant difference between mean anxiety towards mathematics of boys and girls of the secondary students.
secondary students.

H0_3: There is no significantly co-relationship between anxiety towards mathematics and achievement in mathematics of the secondary students.

Population and Sample

In the proposed study, the population is the secondary students of Jangal-Mahal of West-Bengal under West-Bengal Board of Secondary Education (WBBSE). The researchers used stratified cluster sampling in which we have 29 blocks and 4 sub-divisions of the district Paschim-Medinipur of Jangal-Mahal of West-Bengal. Out of these specially eleven blocks and one part of a sub-division is in the portion of Jangal-Mahal. Then we had select secondary school from these twelve areas preserving randomness as far as possible. We have selected six schools from the said area. The sample size of the students of this study is 394. Table 1 show the sample of this study.

Tools and data collection tools

To conducting this study we used the following tools.
1. Self constructed standardized achievement test used for measure of mathematics performance of the secondary students.
2. Self constructed standardized questioner prepared to measure the anxiety towards mathematics of the secondary students.

In order to evaluate the students’ anxieties towards mathematics, a Likert type mathematics anxiety scale developed and standardized by the authors. The scheme of scoring involved different weighting such as for strongly agree was given a weight 5, agree a weight of 4, undecided a weight of 3, disagree a weight of 2, strongly disagree a weight of 1 in respect of responses, imparting to positive statement. The scoring is just reverse for negative worded items. The Cronbach’s alpha reliability of the scale was found as 0.904, standardized mean is 58.46 and standard deviation 17.01. In this scale, there were total twenty items out of these nine positive and eleven negative statements. Therefore the highest possible points to be obtained from the twenty statements are hundred points, while the lowest is twenty points. If the points’ level is high, this would show that the anxiety towards the Mathematics lesson is high. Also for asses the students’ achievement in mathematics, an achievement test (full marks 50) constructed by the authors on the basis of the syllabus of West Bengal School of Secondary Education. The Cronbach’s alpha reliability of the achievement test was found as 0.92, standardized mean is 28.4 and standard deviation 9.77.

Data analysis

In this study, for analysis of collected data quantitatively, the researcher used descriptive and co-relational statistics.

All analyses were performed by using the Statistical Package for Social Sciences (SPSS) software. Two dependent variables were measured in the study- one is anxiety toward mathematics and another is achievement in mathematics. The independent variable measured the gender of students. The data was analysed by using independent samples t-tests and correlation for main effect at the 0.05 level of significance.

FINDINGS

The findings of the study are given according to the research questions.

H0_1: There is no significant difference between mean achievement in mathematics of boys and girls of the secondary students of Jangal-Mahal.

As shown in Table 3, there is no significant difference between gender concerning the students’ achievement in mathematics \( t \approx 1.922, \ p>0.05 \). Though findings in Table 2 showed that boys students mean scores (21.02) on their mathematical achievement towards mathematics little more than girls students mean scores (19.65). Hence, it can be said with 95% confident that there is no significant difference in mathematical achievement between boys’ and girls’.

H0_2: There is no significant difference between mean anxiety towards mathematics of boys and girls of the secondary students of Jangal-Mahal.

As shown in Table 4, there is no significant difference between gender concerning the students’ anxiety towards mathematics \( t \approx 1.901, \ p>0.05 \). Here findings
Table 2. Achievement Score and Anxiety Score of Students

<table>
<thead>
<tr>
<th>Gender of Students</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achievement</td>
<td>M</td>
<td>181</td>
<td>21.02</td>
<td>7.15</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>213</td>
<td>19.65</td>
<td>6.93</td>
</tr>
<tr>
<td>Anxiety</td>
<td>M</td>
<td>181</td>
<td>61.00</td>
<td>15.92</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>213</td>
<td>64.26</td>
<td>18.08</td>
</tr>
</tbody>
</table>

Table 3. t-test of Achievement Score of Students

<table>
<thead>
<tr>
<th>t-test for Equality of Means</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
<th>Mean Difference</th>
<th>Std. Error Difference</th>
<th>95% Confidence Interval of the Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equal variances not assumed</td>
<td>1.922</td>
<td>377.685</td>
<td>.055</td>
<td>1.37</td>
<td>0.71</td>
<td>Lower: -0.031, Upper: 2.771</td>
</tr>
</tbody>
</table>

Table 4. t-test of Anxiety Score of Students

<table>
<thead>
<tr>
<th>t-test for Equality of Means</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
<th>Mean Difference</th>
<th>Std. Error Difference</th>
<th>95% Confidence Interval of the Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equal variances not assumed</td>
<td>-1.901</td>
<td>389.48</td>
<td>.058</td>
<td>-3.26</td>
<td>1.717</td>
<td>Lower: -6.64, Upper: 0.112</td>
</tr>
</tbody>
</table>

Table 5. Correlations between Achievement score and Anxiety Score of Students

<table>
<thead>
<tr>
<th>Achievement of Students</th>
<th>Pearson Correlation</th>
<th>Sig. (2-tailed)</th>
<th>N</th>
<th>Anxieties of Students</th>
<th>Pearson Correlation</th>
<th>Sig. (2-tailed)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achievement</td>
<td>1</td>
<td>0.006</td>
<td>394</td>
<td>Anxiety</td>
<td>-0.139**</td>
<td>0.000</td>
<td>392</td>
</tr>
<tr>
<td>Students</td>
<td></td>
<td></td>
<td></td>
<td>Students</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** Correlation is significant at 0.05 level (2-tailed)

showed in Table 2 that boys students mean scores (61) on their mathematical anxiety towards mathematics less than girls students mean scores (64.06). Hence, it can be said with 95% confident that there is no significant difference in mathematical anxiety between boys' and girls'.

H₀₃: There is no significantly co-relationship between anxiety towards mathematics and achievement in mathematics of the secondary students of Jangal-Mahal.

As displayed in Table 5, the test of hypothesis at 95% (0.05 significance level) confidence level revealed a low negative correlation of -0.139. Thus, per this study, even though there is a negative correlation between anxiety towards mathematics and achievement in mathematics, the correlation is significant. Hence, we reject the null hypothesis. There is a significant co-relationship between anxiety towards mathematics and achievement in mathematics of the secondary students.

** DISCUSSION AND CONCLUSION **

In the present study, the achievement in mathematics and anxieties towards mathematics attending different high schools were investigated in terms of gender difference. When the results of students’ achievement in mathematics and anxieties towards mathematics were examined according to gender, an interesting statistical relation was found between achievement in mathematics and anxieties towards mathematics in terms of gender.
Here findings showed that boys students mean scores (21.02) on their mathematical achievement in mathematics little more than girls students mean scores (19.65) and there is no significant difference between gender concerning the students’ achievement towards mathematics $[t_{(394)}= 1.922, \ p>0.05]$. Also there is significant difference among boys and girls students regarding anxiety towards mathematics $[t_{(394)}= -1.901, \ p>0.05]$, where boys students mean scores (61) on their mathematical anxiety towards mathematics little less than girls students mean scores (64.26). As displayed in Table 5, the test of hypothesis at 95% (0.05significance level) confidence level revealed a low negative correlation of -0.139. Thus, per this study, even though there is no significant difference in achievement in mathematics among boys and girls, there is no significant difference found towards anxiety in mathematics. Also we can conclude that there is a negative correlation between anxiety and achievement i.e. if anxiety towards mathematics be increased then their achievement in mathematics certainly would decrease.

**Limitation and further study**

The researchers had given their best effort for the study and followed all the standard methods and procedures for completeness of the research. In spite of that, due to some inherent constraints, the researcher might have to face some limitations in the study:

Jangal-Mahal comprises with three districts Paschim-Medinipur, Bankura and Purulia. Though greater number of students might have been chosen to give a better representation of population under this study and facilitate the better generalization but as it is a large area, researcher restricted only the district Paschim-Medinipur. There is huge related literature on mathematics education. Here we are studied only the relationship between anxiety towards mathematics and achievement in mathematics. More analytical study could be possible with the help of selecting the sample on the basis of different variables anxiety, sociological, cultural, economical, geographical, linguistic stratifications, teachers’ anxiety, parent anxiety, curriculum, evaluation techniques etc. We are confined only within the variables anxiety and achievement in mathematics. Examination performance, though at par with achievement test, does not always follow the criteria of a good test. Then also we prepared a standardized achievement test in mathematics with following the syllabus of West Bengal School of Secondary Education. On the other hand, this current research study is limited with the responses given by high school students to items in the questionnaires in a natural setting. Naturally, it may be hard to determine students’ anxiety and achievement in mathematics using only a survey therefore next study could involve the conducting of classroom observations and in-depth interviews with high school students in order to capture what principal causes behind students’ anxieties and achievement in mathematics towards mathematics.

Finally, due to the limited sample size (high schools in a province of Paschim-Medinipur), therefore, it may be hard to generalize the results of the present research to other environments. Therefore next studies could examine whether similar findings can be obtained from studies based on extensive samples from different districts, regions and countries.

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