

Mathematics Achievement of Secondary School Students in Relation to Mathematical Anxiety: Analysis and Suggestions

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ABSTRACT

The mathematics achievement of secondary school students is greatly affected by many psychological factors like intelligence, learning habits, mathematical anxiety, motivation, concentration, self-confidence, and academic stress. Out of this, mathematical anxiety is prominent one as it is a feeling of tension and apprehension. In fact, it is the ratio of “tension felt” by a pupil to the “support available.” In the present review, we have analyzed all the factors responsible for mathematical anxiety to decide the achievement in mathematics. To practice mathematical problems and to feel anxious about the same are the main reasons by which pupils get bored with mathematics during their middle classes. In some cases, even pupils at primary school level may feel mathematical learning as tough and suffer from low confidence. In the present review, we have tried to figure out the reasons how mathematics achievement gets affected by mathematical anxiety. To overcome the problem of mathematical anxiety and to earn mathematical achievement, students should be taught by the teacher with improved teaching and learning methods so that they may feel encouragement towards mathematics.

Keywords: *Mathematical Anxiety, Personality Development, Mathematical Achievement*

Mathematics is a powerful tool for global communication. With its help, the pupils can solve real and complex problems and excel in other subjects as well where mathematical understanding is must. In global context, mathematics inculcates logical thinking in the pupils and makes the other dependent subjects also interesting. With mathematics, they can develop mental discipline and explore the world more. Mathematics increases logical reasoning, creative and critical thinking, and problem-solving capability. However, the pupils remain scared from mathematics as they do not make a habit of solving mathematical problems. The parents and teachers generally scold a pupil when he is unable to do well in mathematics without knowing the fact that he might be suffering from mathematical anxiety. In other words, due to down performance in mathematics, he feels social humiliation and, in this way, with the passage of time, he develops mathematical anxiety in himself. It leads to restricted academic achievement and low self-esteem.

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Mathematics anxiety is a multilevel psychological concept that includes factors like performance inadequacy, feelings of pressure and test anxiety. It affects the capability of solving mathematical problems in a number of ways in an academic environment (Kazelskis, 1998). The gender of the student plays a significant role in deciding mathematical anxiety. Aiken (1970) demonstrated that there is a gender difference in mathematical anxiety. The male students show slightly more interest in mathematics than the female students during elementary and junior high school days. Betz (1978) observed that female students report more anxiety towards mathematics as compared to male students. Campbell and Evans (1997) found that female students show more mathematical anxiety during school and college levels.

A significant relationship has been seen between mathematical anxiety and parental education in various studies. Satyanandan (1969) found that the children of the parents with graduate degree perform better than those with matriculate degree only. Faize and Dahar (2011) observed that the students show better performance whose mothers are educated than those having illiterate mothers. Maloney (2015) demonstrated that the anxiety of parents towards mathematics can play a significant role in deciding children's ability for achievement in mathematics. They can develop the same mathematical anxiety as that of their parents. Srivastava et al. (2015) also examined that in case of the children whose parents are uneducated or less educated, they remain more anxious about mathematics than those having one or both parents educated.

The mathematical knowledge is now being applied in many new fields for complete understanding. Therefore, the present review may help to develop an understanding how mathematical anxiety is correlated to achievement in mathematics. The broader aim of this review article is to judge all the factors responsible of mathematical anxiety in connection with the achievement in mathematics.

Justification of the Review

The findings of this present study can establish the ways how to tackle with mathematical anxiety of the students such as to provide guidance and counselling to the students, to decide the role of parents and teachers for inculcating the mathematical ability among students. It will also add a collection of literature at one place on the problem of mathematics achievement of students in relation to their mathematical anxiety which will lead to the foundation for further research in this area.

Objective

To review the literature regarding mathematics achievement of secondary school students in relation to their mathematical anxiety.

Delimitation of the Review

The review is presented for secondary school students studying in government and private schools only.

REVIEW OF LITERATURE

The boys and girls generally score well and have similar proficiency score in mathematics up to the age of 9, however, a gap becomes significant at around age 13. Fennema and Sherman (1978) showed that male and female students have same performance in mathematics at elementary school level but there exists a significant difference in it during

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middle school with girls showing weak performance and with time and schooling, this difference goes on increasing further.

Tobias (1995) pointed out that mathematical anxiety is a feeling of tension that appears in a person when he performs the manipulation in figures for solving mathematical problems in daily life situations or academic environment. With mathematical anxiety, he usually forgets the mathematical equations and loses his confidence to a larger extent.

Puteh (2002) designated mathematical anxiety as just the reflection of the information gathered by the persons from their surrounding environment. He emphasized that the teachers, parents, and peers are responsible for initiating the mathematical anxiety among a person by provoking him as incapable of solving the problems related to mathematics. Conversely, they can motivate him if he assumes that mathematics is difficult because of his past experiences and make his belief stronger in mathematical skills and solving mathematical problems.

Marsh and Tapia (2002) found that the students having low mathematical anxiety remain more confident, motivated, and excited to solve the mathematical problems as compared to students with higher mathematical anxiety.

Smith (2004) advocated that the teacher should show his own interest in mathematics to reduce mathematical anxiety among the students and to raise their motivation. His study has implications for teachers, parents, and students. To develop an interest in mathematics and to reduce mathematical anxiety, a teacher should encourage the students before using effective and appropriate strategies of teaching.

Yuksel-Sahin (2008), by his study on secondary school students in Turkey, reported that there is a powerful impact of a stereotypical view of mathematical anxiety on mathematics achievement among boy and girl students. In his study, he emphasized that the girl students think that the boys always remain blessed with the knowledge of mathematics whereas the boy students feel that they can perform always better in mathematics as compared to girls. Such a false belief strongly affects negatively the capabilities of the girl students for solving mathematical problems and it has long term adverse effects on their mathematical achievement.

Arem (2009) claimed that mathematics anxiety is an emotional and mental act related to bad past experiences related to mathematics thinking and problem-solving capabilities. These experiences hinder the ability of a student to learn mathematics. In this study, he found that the students who experienced unsatisfactory performance in mathematics face difficulty in believing their abilities to take mathematics comfortably in the future.

Zakaria et al. (2012) worked to find the correlation of mathematical anxiety with mathematics achievement among secondary school students in Selangor, Malaysia. They used Fennema-Sherman Mathematics Attitudes Scale on 195 secondary school students to know this correlation. In this analysis, they found that there are significant differences in mathematics achievement based on mathematics anxiety level.

Rashid and Singh (2021) carried out a study to explore the mathematics achievement of government and private school students by selecting 200 respondents using a random

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sampling technique. This study was conducted in Anantnag District of the union territory of Jammu and Kashmir. On the basis of their study, they found that there is no significant difference between students of government and private schools (i) in their achievement towards mathematics, and (ii) in their awareness towards set theory, algebra, trigonometry coordinate geometry, calculus and statistics. In nutshell, they claimed that the impact of type of institution is not significant on mathematical achievement.

Problems Identified in the Previous Studies

1. Students may have mathematical anxiety as a surrounding effect.
2. Students having bad experiences in mathematics during past years feel mathematical anxiety in further classes.
3. Students with high level of mathematical anxiety remain less excited and have low confidence.
4. The girl students believe that the boys always have advantages in mathematical understanding and girls remain far behind them.
5. The type of school, in which the students are studying, may also have sometimes an effect on the level of mathematical anxiety.

Suggestions

Based on the understanding of problem of mathematical anxiety among students developed by reviewing the related literature, the following suggestions for the teachers and school administrators, parents, guardians, and education policymakers can be made:

1. The teachers, school administrators, and other education policymakers should dig more into the reasons leading to the mathematical anxiety among students for improving the performance in mathematics.
2. The school staff and parents should work together to inculcate moral values among the students so that the students can make personal decisions on how to succeed in mathematics.
3. The schools should have counselors for the students having problems in mathematics. Some extra classes can be arranged to improve the standard of the students in mathematics.
4. Several researchers pointed out that the mathematical anxiety starts at the primary level among students. If the fundamentals of mathematics are not clear to the students at this level, the students get trapped in mathematical anxiety and lose their interests. The interest in mathematics can be developed among the students through the detection of mistakes through quizzes and feedback on fundamental aspects like place value, carryover, and borrowing in addition/subtraction and long division, etc.
5. The students take mathematics as enjoyable or tough, it totally depends on class teaching method and concept clarity during primary and secondary level. Therefore, students should be taught by the right methods from the starting with concept clarity so that they do not develop mathematical anxiety and boost their confidence in mathematical achievement.
6. The students should be motivated for the regular practice of mathematical problems which keeps them engaged in finding solutions. This can be easily done by healthy competition in the class and offering them rewards like stickers, stars and excellent work. This type of friendly competition will definitely encourage the positive change towards mathematical anxiety.
7. Both physical and video games are liked by children a lot. Thus, by using the funny and exciting elements of these games and using them in the learning experience, the

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teachers can engage the students in math classes to solve the problems more enjoyable. The gamification is a powerful way to promote mathematics learning.

8. The students should be provided a healthy environment in both school and home in which they can clear their doubts and gain confidence in mathematical understanding without any stress.

CONCLUSION

Mathematical anxiety is an extreme emotional feeling for understanding mathematics and performing in it. The secondary school students suffering from it believe always that they cannot solve mathematical problems comfortably. If at very young age, a student develops mathematical anxiety in him, there is always a possibility that his level of understanding mathematics goes on decreasing year by year. In this way, he might struggle to understand even basic mathematical concepts and try to escape from any situation in which mathematical problem is to be solved. The teacher can play a very important and supportive role by employing some innovative teaching and learning methods which can boost confidence in the students for mathematical problems and develop healthy emotions in them towards mathematical anxiety. In fact, both parents and teachers should realize that the child needs more support and attention in order to overcome mathematical anxiety, and for this, counselling by experts can help in an effective manner. If India has to produce its next generation students ready for technological development, it is very important to tackle mathematical anxiety and develop mathematical reasoning among students.

REFERENCES

- Aiken Jr, L. R. (1970). Non intellectual variables and mathematics achievement: Directions for research. *Journal of School Psychology*, 8(1), 28-36.
- Arem, C.A., 2009. Conquering Math Anxiety. 3rd Edn., *Cengage Learning, Belmont*, ISBN-10: 0495829404, pp: 215.
- Betz N.E. (1978). Prevalence, Distribution and correlates of math anxiety in college students. *Journal of Counseling Psychology*, 25, 441-448.
- Campbell K., Evans C. (1997). *Gender issues in the classroom: A comparison of math anxiety Education*, 117(3), 332-339.
- Faize, F. A., & Dahar, M. A. (2011). Effect of mother's level of education on secondary grade science students in Pakistan. *Research Journal of International Studies*, 19, 13-19.
- Fennema, E. & Sherman J.A. (1978). Mathematics Attitude toward the learning of mathematics by males and females. *Catalog of Selected Documents in Psychology*, 6(1), 31.
- Kazelskis, R. (1998). Some dimensions of mathematics anxiety: a factor analysis across instruments. *Educational and Psychological Measurement*, 58, 623-633.
- Maloney, E.A., Ramirez, G., Gunderson, E.A., Levine, S.C. & Beilock, S.L. (2015). Intergenerational effects of parents' math anxiety on children's math achievement and anxiety. *Psychological Science*, 26, 1480-1488.
- Marsh, G.E. and M. Tapia, 2002. Feeling good about mathematics: Are there sex differences? *Proceedings of the Annual Meeting of the Mid-South Educational Research Association*, Nov. 6-8, Chattanooga, TN, pp: 1-12.
- Puteh, M., 2002. Qualitative research approach towards factors associated with mathematics anxiety. Proceeding of the 3rd International Mathematics Education and Society Conference, (MESC' 02), *Centre of Research in Learning Mathematics*, Copenhagen, pp 1-5.

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- Rashid, M., & Singh, C. (2021). Analyzing mathematics achievement among students, *International Journal of Statistics and Applied Mathematics*, 6(4), 127-130.
- Satyanandan, B.D. (1969). *A study of Socio- economic status and academic achievement*, Govt. College of Education Kurnool Buch Survey, IV.
- Smith, M.R., 2004. *Math anxiety: Causes, effects and preventative measures*. M.Sc Thesis, Liberty University.
- Srivastava, R., Imam, A., & Singh, G. P. (2016). Mathematics anxiety among secondary school students in relation to gender and parental education. *International Journal of Applied Research*, 2(1), 787-790.
- Tobias, S., 1995. *Overcoming Math Anxiety*. 1st Edn., W.W. Norton, ISBN-10: 0393313077, New York, pp: 260.
- Yuksel-Sahin, F., 2008. Mathematics anxiety among 4th and 5th grade turkish elementary school students. *Int. Elect. J. Math. Educ.*, 3: 179-192.
- Zakaria, E., Zain, N. M., Ahmad, N. A., & Erlina, A. (2012). Mathematics anxiety and achievement among secondary school students. *American Journal of Applied Sciences*, 9(11), 1828.

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Conflict of Interest

The author(s) declared no conflict of interest.

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