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Article

Gender Variations in Attitude towards Mathematics and Role of Schools

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Abstract:

Success in STEM education is closely linked to students' understanding and achievement in school mathematics. However, their performance in mathematics is influenced and shaped by several factors; one of the most important factors is their attitude towards mathematics. This attitude, in turn, is influenced by various personal and educational factors. In this context, the present study examines the influence of gender and type of school on students' attitudes towards mathematics. The study was conducted on 720 Class 10 students enrolled under two educational boards, JKBOSE and CBSE. To ensure adequate representation of students from different geographical regions, the sample was drawn from three districts representing the southern, central, and northern parts of the Kashmir Valley. The findings reveal significant differences in students' attitudes towards mathematics based on both gender and school board. Male students demonstrated a more favourable attitude towards mathematics than female students, while CBSE students reported a more positive attitude than their counterparts studying under JKBOSE.

Keywords: Gender, Attitude, Attitude towards Mathematics, CBSE, JKBOSE

1. INTRODUCTION

Mathematics is one of the important subjects taught at school. It is considered a distinguished subject in the school curriculum, being a source of logic and reason development in learners (Bruder, 2020). Though there is no concrete and unique definition of mathematics, it is usually defined as a science of measurement, quantity and magnitude or a study of numbers, shapes and structure (Yadav, 2017). It is broadly divided into three branches: arithmetic, algebra and geometry (Stillwell, 1997). Students who are good at understanding learn it easily and quickly as compared to those who are good at memorisation (Kloosterman, 2002). Due to this property, mathematics enjoys distinction among subjects. It needs analytical reasoning to understand. Being a technical language using symbols and signs for communication of concepts, it is the only language which is universal, free from dialects, exact and compact (Devlin, 2000; Veel, 1999). It is observed that teachers, parents and students, being stakeholders in the learning process, are more concerned about mathematics (Handal, 2003). This is a genuine concern for all. It requires a lot of time for children to practice at a varied pace (Keiser & Lambdin, 1996). There are only a few schools that provide extra teaching periods for mathematics (O'Meara & Prendergast, 2019; Farbman & Kaplan, 2005). Many times, the curriculum does not provide any guidelines regarding the time distribution with respect to the varying time requirements of different subjects; it remains at the discretion of school heads and administrators. For teaching mathematics, morning time with a fresh mind is considered most suitable for learning based on reason and logic (Ababtain, 2020; Rahman & Ahmar, 2016), whereas physical and mental tiredness impedes reason-based learning (Thomas et al., 1975).

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2. ATTITUDE TOWARDS MATHEMATICS

Attitude towards Mathematics is the student's pre-arranged tendency to think, feel, perceive, and behave towards mathematics or a sense of good or bad feeling towards this subject. It is a combined measure of "liking or disliking of mathematics, a tendency to engage in or avoid mathematical activities, a belief that one is good or bad at mathematics and a belief that mathematics is useful or useless" (Neale, 1969). Various forces are being considered responsible for the development of liking or disliking of this subject. These forces include teachers, parents, elder siblings, peers and relatives. These may also include bad learning experiences with this subject in the past (Aiken Jr, 1970).

3. GENDER AND ATTITUDE TOWARDS MATHEMATICS

Attitudes play an important role in day-to-day life events. Positive attitudes lead to better performance. Children having a positive attitude towards mathematics perform better in mathematics tests in comparison to those having a negative attitude towards mathematics (Abosalem, 2015). Gender variation in attitude towards mathematics is significant and decisive in children's mathematics achievement (Cvencek et al., 2021; Frost et al., 1994). These variations are insignificant at early stages of schooling but keep developing explicitly with increasing age through elementary and secondary stages (Brandell & Staberg, 2008). Girls show more negative attitudes towards mathematics than boys, especially in coeducational schools, which hampers their performance in mathematics (Eshun, 2004). On the other hand, various studies support the viewpoint that boys and girls do not differ significantly in attitude towards mathematics. Though gender differences are not significant, girls' positive attitude towards mathematics decreases continuously, and teacher support and peer acceptance have a positive bearing on their attitude towards mathematics (Mata et al., 2012). Sometimes teachers become an important source for transmitting negative attitudes and emotions towards mathematics in their students (Fritz et al., 2019). Parents also pressurise their children to work hard with the belief that success in mathematics is more dependent on effort than ability, resulting in the development of anxiety and negative attitudes towards mathematics (Stankov, 2010). Parents' attitudes towards mathematics work as a predecessor for their children's attitudes towards mathematics (Soni & Kumari, 2017). It gets boosted by ineffective teaching practices, textbooks lacking continuity and cohesion, projecting mathematics as an abstract and alien thing devoid of utility connection, the myth about the mathematical mind, and bad learning experiences (Mazana et al., 2019).

4. TYPE OF SCHOOL AND ATTITUDE TOWARDS MATHEMATICS

Schools usually vary by nature of their management, classified as government and private schools, religious schools, residential and non-residential schools, community schools, special schools, trust schools, or tribal schools, etc. With this varying nature of schools, different study-related parameters can also vary from school to school. Researchers rarely try to understand and explore the differences among students on various characteristics with respect to their multiple school backgrounds. Attitudes of students from different types of schools have been studied by very few researchers. Differences in attitude exist among students from single-sex and coeducational schools. Girls from coeducational institutions suffer more mathematics-related issues than girls from girls' schools and lack confidence in doing mathematics. On the other hand, students are motivated towards mathematics and develop a positive attitude towards mathematics in their respective single-sex schools in comparison to coeducational schools (Eshun, 2004). Also, students from residential schools and students having highly educated parents show better adjustment at school and hence develop a more favourable attitude towards mathematics as compared to the students from non-residential schools (Ganai & Mattoo, 2023). A significant difference is evident in attitude and anxiety among students towards mathematics with respect to the nature of affiliation, such as private, public and missionary schools (Chowdhury, 2016; Khatoon & Mahmood, 2010). Parental education plays a significant role in developing

5. OBJECTIVES OF THE STUDY

1. To compare students' attitudes towards mathematics by gender.

2. To compare students' attitudes towards mathematics based on their school affiliation (JKBOSE and CBSE).

6. METHODOLOGY

A Sample of 720 students for this descriptive study was drawn from three districts, namely Anantnag, Srinagar and Kupwara, representing the southern, central and northern regions of the Kashmir Valley. Stratified random sampling technique was employed for the data collection. Schools affiliated to both provincial board (JKBOSE - Jammu and Kashmir Board of School Education) and central board (CBSE - Central Board of Secondary Education) were selected in proportion to their number in the three districts to maintain the ratio. 390 students (208 males and 182 females) from JKBOSE schools and 330 students (189 males and 141 females) from CBSE schools participated in the study. The study used a 22-item standardised Mathematics Attitude Scale (MAS-*IAKT*) developed by Imam and Khatoon (2012) for data collection. The scale measures attitude towards mathematics on three dimensions, namely Usefulness of Mathematics, Confidence in Learning Mathematics and Enjoyment of Mathematics, with 11 positive and 11 negative items, having a reliability coefficient of 0.93. The data were analysed using SPSS, in which *a t*-test was employed to test the significance of the mean difference between the groups.

7. ANALYSIS AND INTERPRETATION

Table 1: *Gender based comparison on Attitude towards Mathematics*

Dimensions	Male (397)		Female (323)		Mean Diff.	t
	Mean	S.D	Mean	S.D		
Usefulness of Mathematics	36.92	8.946	34.04	9.704	2.88	4.13**
Confidence in Learning Mathematics	22.89	7.516	21.63	6.883	1.26	2.33*
Enjoyment of Mathematics	12.46	4.383	12.39	3.813	0.07	0.23
Composite Score	72.27	16.22	68.07	17.56	4.2	3.3**

**Sig. at 0.05 level; **Sig. at 0.01 level*

From Table 1, we observe that the mean scores of male and female students differ significantly in Usefulness of Mathematics and Confidence in Learning Mathematics, whereas no significant difference is found in their mean scores on Enjoyment of Mathematics. The overall mean score of 72.27 with a standard deviation of 16.22 for males is significantly higher than the mean score of 68.07 with a standard deviation of 17.56 for females, showing that males differ significantly from females with $t = 3.30$ at .01 level of significance on attitude towards mathematics.

Table 2: *Type-of-School based comparison on Attitude towards Mathematics*

Dimensions	JKBOSE Students (390)		CBSE Students (330)		Mean Diff.	t
	Mean	S.D	Mean	S.D		
Usefulness of Mathematics	34.64	9.167	36.82	9.538	2.18	3.15**
Confidence in Learning Mathematics	21.58	6.740	23.19	7.709	1.61	2.99**
Enjoyment of Mathematics	12.18	3.843	12.71	4.443	0.53	1.71
Composite Score	68.39	16.14	72.74	17.60	4.35	3.42**

***sig. at 0.01 level*

From Table 2, it can be observed that students (affiliated with CBSE) show significantly higher mean scores in two dimensions: (i) Usefulness of Mathematics and (ii) Confidence in Learning Mathematics, but no significant difference is seen in (iii) Enjoyment of Mathematics. In the case of composite scores for students from both affiliating boards (JKBOSE and CBSE), the mean scores on Attitude towards Mathematics are 68.39 and 72.74, and *S.D.* is 16.14 and 17.60, respectively. The mean difference of 4.35 is observed to be significant at the .01 level, with a *t*-value of 3.42.

8. CONCLUSION

This study was conducted to check whether students differ in attitude towards mathematics on the basis of gender and type of school. Results of the study reveal that male students' scores are significantly higher on usefulness of mathematics and confidence in learning mathematics than female students, but both genders feel similar enjoyment in mathematics. Composite mean scores of male and female students signify that the attitude towards mathematics is higher in male students in comparison to female students. While comparing students on the basis of their school affiliation, it is observed that the students from CBSE schools consider mathematics more useful and are more confident in learning mathematics in comparison to their JKBOSE counterparts. On the other hand, CBSE students and JKBOSE students do not differ significantly in enjoyment of mathematics, but both the groups do differ significantly in the overall score on attitude towards mathematics, with CBSE students showing a better attitude towards mathematics in comparison to the JKBOSE students. Finally, we can conclude that the gender variances are persistent, with males having a more positive attitude towards mathematics, and the students studying in CBSE schools possess a better attitude towards mathematics. These differences can be safely attributed to the natural tendency of male students towards maths, shaped by social perceptions of mathematics as a dominant and masculine subject. The difference in the attitude of CBSE and JKBOSE students towards mathematics is the manifestation of a lack of infrastructure, libraries, laboratories and well-trained teachers in provincial board schools in comparison to CBSE schools.

DECLARATIONS

Author(s) Contribution

All author work equally.

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The data will be available on reasonable request.

Competing Interests

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Human Ethics and Consent to Participate

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