

A Comparative Analysis of Attitude towards Mathematics among Higher Secondary Students in South Gujarat

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Abstract:

Attitude is a critical affective determinant of academic success, particularly in a subject of Mathematics. This study investigates the attitude towards Mathematics among higher secondary school students in the South Gujarat region. Adopting a descriptive survey design, the researcher selected a representative sample of 507 students using a cluster sampling technique. The Mathematics Attitude Scale was employed to collect data. The study analysed the influence of three variables: Gender (Boys vs. Girls), Type of School (Grant-in Aid vs. Self-financed), and School Location (Urban vs. Rural). The data were analysed using means, standard deviations, and independent samples t-tests. The findings reveal no statistically significant difference in attitude towards Mathematics based on school location. However, highly significant difference were observed across gender and school type. Female students exhibited a significantly more positive attitude towards mathematics compared to male students. Students attending grant-in-aid schools demonstrated a markedly more positive attitude compared to those enrolled in self-financed institutions. The paper concludes with pedagogical recommendations aimed at fostering mathematical interest among learners.

1. Introduction:

Education is a continuous dynamic, and comprehensive process aimed at the comprehensive growth of an person. By education, the cognitive, affective, and psychomotor domains are nurtured, fostering intellectual growth, emotional maturity and practical skills. Whereas the cognitive domains focus on logic and analysis and affective domains includes attitude, values interest, and emotions is equally critical. Education is not only a just process of effective communication knowledge but an effective way for shaping an individuals over all personality. Human analytical powers, which discriminates individual from other living being, remains undeveloped automatically, its requires conducive social atmosphere and actives engagements in learning journey.

In this educational frameworks attitudes function as a backbone of affective domain, having a significant impact on the learning progression. As stated by Singh(2017), Attitude generally conceptualized as a tri- component construct comprising cognitive, The cognitive component encompasses an individuals beliefs and perspectives regarding a subject, the affective domain reflects their emotional responses and feelings and the behavioural domains denotes their readiness or predisposition to act in a given context. The integrated growths of this component is necessary for an attractive teaching and learning process. Desai(2013) defined Attitude cognitive disposition of agreement or not disagreement towards a system of area of study. Which may be positive, negative or neutral. This is especially pertinent in the framework of

mathematics, A disciplines that requires logical thinking, problem solving competencies and continuous cognitive engagement. Students are introduced to mathematics from an early ages and based on their various learning experiences, they form a distinct mental dispositions referred to as Mathematical Attitude. Positive Attitude promotes motivation, interests and self confidence while negative Attitudes frequently leads to Mathematics anxiety and avoidant behaviour. As a result of ongoing changes in curriculum framework and Evaluation Systems, Numerous Students develop fear and confusion regarding subject.

Consequently, understanding these attitudes has become a paramount concern for educators, as attitude plays a significant role in the accurate understanding and application of mathematical knowledge.

Despite the extensive global research on mathematical attitudes, there is a limited understanding of how these factors manifest within the specific demographic and educational context of South Gujarat. Students in this region operate within a unique socio-cultural framework that may influence their academic perceptions differently than their western or eastern counterparts. Therefore, the present study aims to provide a comparative analysis of attitudes towards mathematics among higher secondary students in South Gujarat, bridging the gap between global theoretical frameworks and local educational realities.

1.1 Operational definition

Attitude Freeman (as cited in Gupta & Gupta, 2019) described attitude as “a learned readiness to respond to certain situations, persons, or objects, which becomes a characteristic and consistent way in which an individual responds” (p. 627). Manav (2014) defined attitude as “the tendency to respond in a favourable or unfavourable manner toward a person, object, or ideology on the basis of prejudices” (p. 525).

Mathematics Benjamin Peirce (as cited in Doctor, Patel, & Kothari, 2005) succinctly described mathematics as “a science that draws necessary conclusions” (p. 1).

Higher Secondary School The educational framework for this study is based on the structure outlined by the National Policy on Education (1986). According to the policy, the Indian school system follows the 10+2 pattern, wherein higher secondary education represents the final two years of schooling (Classes XI and XII) immediately following the completion of secondary education.

2. Review of Literature

To measure and understanding these complex Attitudes Researchers have developed and validate various standardized instruments have been developed world wide. For example Majeed, Darmawan and Lynch(2013) Standardize and validate Attitude toward mathematics

inventory among South Australians student. Their research validated a robust four factor structure consisting of self confidence, enjoyment, value, and motivations. The findings provided significant insights into although Students recognize the significant of mathematics, they may still lacks of confidence and motivations necessary for further engagement and advancement in the discipline. Likewise Yasar(2014) constructed a scale 19 items Attitudes towards mathematics scale using data from Secondary students. Determines factors Value, Enjoyment, anxiety and perceived successes as core factors. The study established that the refined instrument accounted for 65.2 percent of the variance in students Attitudes, indicating the multidimensional nature of the construct. Addressing cultural specificity, Facultada and Sebial (2019) validated a similar scale in the Philippines, noting that social influences (teachers and parents) are distinct factors alongside anxiety and self-efficacy.

3. Objective of study

1. To Study Students attitude towards mathematics at higher secondary level of Soth Gujarat.
2. To examine gender based differences in attitudes towards mathematics among higher secondary school students in south Gujarat.
3. To evaluate difference in attitude towards Mathematics between urban and rural higher secondary school students in South Gujarat.
4. To compare the attitude towards Mathematics among higher secondary level school students enrolled in Grant in Aid and Self Finance School of Soth Gujarat.

4. Hypothesis

Ho1: There is no statistically significant difference in the attitude towards male and female higher secondary school students in Soth Gujarat.

Ho2 : There is no statistically significant difference in the attitude towards Mathematics between higher secondary school students residing urban and rural areas of Soth Gujarat.

Ho3 : There is no statistically significant difference in the attitude towards Mathematics between higher secondary school students enrolled in Grant in aid and Self Finance School schools in Soth Gujarat.

5. Methodology

The target population for the present study comprised all higher secondary school students enrolled in Mathematics across the South Gujarat region of Gujarat State. The South Gujarat region includes the districts of Bharuch, Dang, Surat, Valsad, Narmada, Navsari, and Tapi. All higher secondary school students offering Mathematics as a subject in these districts constituted the target population of the study.

Cluster sampling technique was used to selected sample of the present study. Out of 7 districts of south Gujarat 50% districts selected as a cluster. Therefore Surat, Navsari, Bharuch and Narmada district Selected as clusters. From the selected districts, 10 percent of talukas were selected using cluster sampling technique. Further, 5 percent of higher secondary schools from the selected talukas were selected as clusters. Therefore total 507 Students studying Mathematics in the selected schools constituted the final sample of the study. The researcher used the survey method in the present study.

Mathematics Attitude Scale was used to assess the students' attitude. The Mathematics Attitude Scale (MAS), developed and standardized by the investigator from an unpublished raw data. The scale was constructed following the Likert method of summated ratings. The Scale items are scored on a 5 point Likert continuum ranging from strongly agree to disagree. The standardization process was executed in two distinct phases. IN the initial Phases an item analysis was performed on a preliminary sample of 427 higher secondary school students to identify and select items with high discrimination indices. Subsequently the instrument was administered to a representative sample of 220 higher secondary school students to establish its psychometric properties, specially construct validity and internal consistency reliability. The MAS tool demonstrate high reliability across various indicators. Internal consistency of the MAS scale was established using Cronbach's Alpha, Which was determined to be 0.91. Stability of the MAS scale was measured using Test-Retest Method, which was determined to be 0.88. The Split Half reliability was calculated at 0.82, Suggesting Strong internal Consistency. Face and Content Validity validated though expert review. To establish concurrent validity, the scores obtained on this scale were correlated with MAS constructed by Krishnan(2019). Resulting validity coefficient was 0.70, Suggesting a strong positive correlation and highly validity for a new developed MAS tool.

6. Results

Table 1 Staistical Data of students towards mathematics(MAS) at higher secondary

Sr.	Statistical Measure	Value
1	Mean	201.6942801
2	Standard Error	1.302949587
3	Median	203
4	Mode	216
5	Standard Deviation	29.33807349
6	Sample Variance	860.7225562

Sr.	Statistical Measure	Value
7	Kurtosis	-0.769321452
8	Skewness	0.053896428
9	Range	141
10	Minimum	128
11	Maximum	269
12	Sum	102259
13	Count	507
14	Largest(1)	269
15	Smallest(1)	128
16	Confidence Level(95.0%)	2.559857249

Table -1 Represent the descriptive statistical analysis of students Attitudes towards mathematics (MAS) at higher secondary level. The mean score 201.69 indicates that, on average, students possess a moderately positive attitude towards mathematics (MAS). The Median Value are 203 are very closed to mean, which represents that distribution of Attitude towards mathematics score is fairly symmetrical. The modal value are 216 which indicating the most frequently occurring Attitude towards mathematics score among students is relatively high, This suggests that a substantial proportion of students hold a favourable attitude towards mathematics. The standard deviation value are 29.34 represents a moderate level of variability is students Attitudes towards mathematics, indicate that students differ in their perceptions and feeling towards mathematics. The value of variance are 860.72 further indicates the presence of variability within the data set. The value Skewness coefficient of 0.054 closely to zero, Indicating that distribution of score is approximately symmetrical and normally distributed. The Kurtosis of value -0.77 are negative which depicting a platykurtic distribution, that means data is more spread out and flatter than normal distribution . The range score are 141, with maximum score of 269 and minimum score of 128, represents a wide spread of students attitudes towards mathematics, representing the presence of both high and low attitude towards mathematics among students. The total sum of score (102259) and sample size (N = 507) indicate that the results are based on a large and reliable sample. The confidence level (95% = 2.56) indicates that the mean attitude score is statistically reliable and can be generalized to the population with a high degree of confidence.

Table-2 Difference in the attitude towards mathematics of higher secondary students with references to gender

Gender	N	Mean	SD	Calculated t-Value
Male	305	199.1783	29.055	2.234
Female	202	204.9955	29.33	

Note N= sample size SD= Standard deviation

Table 2 illustrates the statistical comparison of mathematical attitudes between male and female higher secondary students. The mean score of male students obtained 199.18, and standard deviation SD are 29.05) is lower than female students are 204.99, and standard deviation SD are 29.33, pointing that female students represents a more positive attitude towards mathematics than male students. The calculated critical t-value are 2.234 is more than the critical t-value at the 0.05 level of significance. This represents that the difference in average scores of male and female students is statistically significant at 0.05 level. Therefore, the null hypothesis establish that there are no significant difference in mathematical attitude with respects to gender is rejected at the 0.05 level of significance.

Table3 Differences in the attitude towards mathematics of higher secondary students with respect to Area

AREA	N	Mean	SD	Calculated t-Value
Urban	255	203.125	28.4707	0.9482
Rural	252	200.642	30.43806	

Note N= sample size SD= Standard deviation

Table3 shows the comparison of attitude towards mathematics of higher secondary students with respect to urban and rural area. The mean attitude scores of urban students (M are 203.13, SD are 28.47) is slightly higher than that of rural students (M are 200.64, SD are 30.44), indicating that urban students have a somewhat more positive attitudes towards mathematics than rural students.

The calculated t-statistic 0.9482 is lower than t-value at the 0.05 level of significance. This represents that the difference between urban and rural students mathematical attitudes is not statistically significant on 0.05 level. Therefore, the null hypothesis(HO3) indicating that there are no significant difference in attitude towards mathematics with respect to area is accepted.

Table-4 Differences in the attitude towards mathematics of higher secondary students with regard Type of School

TYPE OF SCHOOL	N	Mean	SD	Calculated t-Value
Self-Finance	305	198.6852	30.89	3.12
Grant in-Aid	202	206.7327	26.81	

Note N= sample size SD= Standard deviation

Table 4 represents the comparative analysis of mathematical attitudes among higher secondary schools students across different types of school(Self finance vs grant in aid) . The mean attitude score of Self Finance school students (M = 198.69, SD = 30.89) is lower than that of Grant-in-Aid school students (M = 206.73, SD = 26.81). This indicates that students studying in Grant-in-Aid schools have a more positive attitude towards mathematics compared to students in Self Finance schools. The calculated t-value are 3.12 is more than the critical t-value at the 0.05 level of significance (approximately 1.96). This shows that the difference in mean attitude scores between Self Finance and Grant-in-Aid school students is statistically significant at the 0.05 level. Therefore, the null hypothesis posits that there is no significant difference in mathematical attitudes with respect to type of schools is rejected at 0.05 level.

7. Discussion

The present study offers a comprehensive look into the mathematical attitudes of higher secondary students in South Gujarat. The descriptive analysis sets a positive tone, revealing an average mean score of 201.69. This suggests that the "fear of mathematics" often cited in popular culture is not the dominant reality in this region. Instead, students appear to hold a balanced and moderately favourable view of the subject, likely recognizing it as a gateway to professional success in a science-oriented academic environment. The Shift in Gender Dynamics One of the most striking revelations of this research is the significant difference in attitudes based on gender. Contrary to long-standing stereotypes that often link mathematical inclination to males, this study found that female students possess a significantly more positive attitude (M is 204.99) than their male counterparts (M is 199.18). the rejection of the null hypothesis reflects the evolving Socio- educational characteristics of South Gujarat. It indicates that girls are approaching mathematics with higher motivation and lower inhibition. This shift may be attributed to increased familial support for girls' education and a growing resilience among female students to excel in competitive STEM fields. The Urban-Rural area In an era where the digital divide is a major concern, the findings regarding geographical location are particularly heartening. The study found no statistically significant difference between urban

and rural students. This indicates a "democratization" of mathematics education in South Gujarat. Whether a student resides in a bustling city like Surat or a quiet village, the consistency in curriculum delivery and the accessibility of learning material have levelled the playing field. Mathematics, in this context, acts as a universal language that transcends geographical boundaries. The Institutional Factor: Grant-in-Aid vs. Self-Finance. A critical point for academic reflection arises from the comparison of school types. The data clearly shows that students in Grant-in-Aid schools hold a significantly more positive attitude towards mathematics (M is 206.73) than those in Self-Financed Schools (M is 198.69). While Self-Financed schools often boast superior infrastructure, this result suggests that infrastructure alone does not shape attitude. The stability, pedagogical experience, and job security of teachers in Grant-in-Aid schools—who are often government-appointed and highly qualified—might be fostering a more nurturing and less high-pressure learning environment. In contrast, the high-stakes, result-oriented pressure often associated with private self-financed schooling may inadvertently be dampening students' intrinsic interest in the subject.

8. Conclusion

The present study provides a nuanced understanding of mathematical attitudes among higher secondary students in South Gujarat, a region characterized by rapid educational and industrial growth. The finding leads to several significant conclusions that question conventional academic assumptions. Firstly the collective findings indicates Attitudes towards mathematics (MAS) in this region is moderately positive, Suggesting that Students largely view the subject as a critical instrument for their professional career aspirations.

Secondly the study effectively achieved deconstructs the gender gap myth in mathematics within the regional context. The significantly more positive attitude towards mathematics exhibited by female students marks a pivotal shifts in socio-educational landscape of Gujarat. Indicating increased motivation and breakdown of traditional gender barriers in STEM - oriented thinking.

Thirdly, the geographical region was found to be non- factor in shaping attitude towards mathematics. This finding suggest that the consistency in responses in curriculum implementation and the extensive availability of educational resources have successfully addressed the urban -rural divide.

Finally the this Research highlights a critical institutional gap, where students from grant-in -Aid schools exhibited. More favourable mathematical attitudes relative to those in self - financed schools. These finding suggest that teachers stability, pedagogical experiences and

nurturing learning environment often found in Government aided schools are more influential than modern infrastructure in fostering a healthy academic mindset.

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