A Study of Achievement in Mathematics Subject in Relation to Attitude Towards Mathematics and Learning Environment of High School Students

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Abstract: The purpose of this study was to determine relationship of attitude towards mathematics and learning environment with achievements in mathematics of high school students. To find out contribution of attitude towards mathematics and learning environment on achievements in mathematics of high school students was also purpose of this study. As a sample of 600 students of grade 10th were selected from 10 secondary schools of Kumaun region of Uttarakhand, using simple random sampling technique. Attitude Toward Mathematics Scale developed and standardized by Rai (2007) and Learning Environment Scale developed by Rai (2007) were used to collect data. To analyzed data Pearson's product moment correlation coefficient and regression analysis were used. Findings of this study indicates that significant and positive relationship exists between attitude towards mathematics and achievement in mathematics. Significant and positive relationship was also found between learning environment and achievement in Mathematics. Attitude towards mathematics and learning environment combinedly contributing 36.161% of variance in prediction of achievement in mathematics.

Key Words: Attitude Towards Mathematics, Learning Environment, Achievement in Mathematics

INTRODUCTION

Mathematics is one of the very important core subjects in school curriculum. Mathematics play significant role in human everyday life. Mathematics is important in learning of science subjects like physics, chemistry, zoology and medical sciences. It is also helpful in social science subjects like economics, sociology and psychology. Statistics is also a branch of mathematics. In this scientific era mathematics is not un-touch with any branch of knowledge. It is an essential and smart key open the minds of the learners to think logically, objectively and reasonably in solving day to day problems. It is the study of abstract ideas and concepts which deals with abstract thinking elements. These elements cannot be described in concrete way. It is truth that at secondary level several students fail in examination due to failure in mathematics subject. Since long time mathematics teacher educators are searching factors of success in mathematics. There are several cognitive, affective, psychomotor and demographic variables that affects mathematics achievement of learner.

But attitude and learning environment are two factors affecting learning in mathematics. Without interest and attitude in learning mathematics learner achievement in mathematics is not possible. Positive attitude towards mathematics can generate energy to learn mathematics and thereby better achievement in mathematics. Thus, attitude is regarded as a key contributor in performance in mathematics (Mohamed and Waheed, 2011; Mata, Monteiro and Peixoto, 2012; Ngussa and Mbuti, 2017). Like attitude, learning environment is also an important factor playing significant role in learning and achievement in mathematics. Teaching and learning environment associated strongly to each other and helpful in performance in following six aspects-inform, communicate, collaborate, produce, scaffold and manage. Learning environment consists all factors and activities within which learning happens. Learning environment includes several individual and social aspects that are responsible for direct or indirect influence on achievement in mathematics of learner. Learning environment can enhance positivity and emery in learner to learn mathematics. Learning environment is an important factor playing important role in development of cognitive and affective domain of learner and thereby achievement in mathematics. According Tella (2008) learning environment plays a major role in shaping the quality of academic achievement in mathematics. Thus, learning environment may be an important factor in achievement in mathematics of students.

Therefore, this study was designed to investigate the relationships of attitude towards mathematics and learning environment with achievement in mathematics of secondary school students.

REVIEW OF RELATED LITERATURE

Studies Related to Attitude towards Mathematics and Achievement in Mathematics

Aiken (1976) study attitude towards mathematics and learning in mathematics and found that significant and positive relationship between attitude towards mathematics and mathematics achievement. Rosaly (1992) found that significant and positive relationship exists between attitude towards mathematics and achievement in mathematics of high school students.

Ma (1997) study revealed that a reciprocal relationship existed between every attitudinal measure and mathematics achievement. Ma & Xu (2004) studied attitude toward mathematics and achievement in mathematics of secondary school students. Results revealed that for all grade levels prior achievement significantly predicts future attitude but prior attitude was not found significant in prediction of future achievement.

Saha (2007) investigated gender, attitude to mathematics, cognitive style and achievement in mathematics. It was found that all the three variables contribute significantly in achievement in mathematics.

Kadijevich (2008) studied dimensions attitude towards mathematics with achievement in mathematics of earth grade students and found that each dimension of mathematics attitude was correlated significantly and positively to mathematics achievement for almost all of the thirty-three countries.

Khatoon and Mahmood (2010) study indicates that there is a positive relationship between mathematics attitudes and mathematics achievement.

Mensah, Okyere and Kuranchie (2013) study indicate that significant and positive correlations exist between students' attitude towards mathematics and achievement in mathematics.

Sanci (2014) investigated correlation of attitudes toward math and math achievement of 9th grade students. A strong significant and positive relationship was found between attitude towards mathematics and achievement in mathematics.

Atanasova-Pachemska *et al.* (2015) study indicates that significant and positive relationship exists between mathematics grade in previous year and attitude towards mathematics. This study also revealed that significant and positive relationship exists between attitude towards mathematics and grade in mathematics on half yearly examination.

Kundu and Ghose (2016) study showed that significant and positive relationships were found between attitude towards mathematics and achievement in mathematics for boys, girls, science, arts, commerce and total sample of Higher Secondary students.

Ajisuksmo and Saputri (2017) studied influence of attitudes towards mathematics-on-mathematics achievement. Findings of the study indicate that significant correlation exist between attitude towards mathematics and academic achievement in mathematics.

Mazana, Montero and Casmir (2019) investigated students' attitude towards learning mathematics in relation to performance in mathematics and found that performance in mathematics correlated significantly and positively with attitude factors confidence, enjoyment, usefulness, motivation and total attitude but correlation of attitude dimension anxiety and performance was not found significant.

Bakar and Ayub (2020) investigated relationship between attitude towards mathematics and mathematical problem-solving achievement among pre-university students in Malaysia and found that significant and positive relationship exists between the overall attitude towards mathematics and mathematical problem-solving achievement.

Mertoğlu (2020) investigated effects of attitudes towards mathematics on success rates of 6th grade students. Finding of Chi-square test showed that there is a statistically significant relationship between success and attitudes towards mathematics.

Studies Related to Learning Environment and Achievement in Mathematics

Adnan *et al.* (2014) studied the learning environment and mathematics achievement of students of high-performance schools (HPS) and found that there was a significant relationship between learning environmental factors and mathematics achievement.

Shamaki (2015) studied influence of learning environment on students' academic achievement in mathematics and found that significant difference exists on mean performance of students taught in an ideal learning environment and students taught in a dull learning environment in favors of ideal learning environment.

Malik and Rizv (2018) study revealed that out of nine subscales of the Classroom Environment Instrument (CEI Personal Form), six of them (Teacher Support, Cooperation, Student Cohesiveness, Involvement, Personal relevance and Emphasis on understanding) were positively and significantly correlated with academic achievement in mathematics of students. Others two subscales (Equity and Investigation) were correlated negatively and significantly with the academic achievement in mathematics of the students. But one subscale of classroom learning environment namely Autonomy was not correlated significantly with students' academic achievement in mathematics.

Ndidi and Effiong (2020) found that the mean performance score of students studying in small classroom was found significantly higher than the mean of those studying in large classroom. It was also found that instructional facilities significantly influenced students' academic performance in mathematics. Students taught through adequate use of instructional materials were found higher achievement in mathematics than the mean score of those students taught with inadequate use of instructional materials.

OBJECTIVES

The following objectives have been formulated for the present study:

1. To find out relationship between achievement in mathematics subject and attitude towards mathematics of high school students.
2. To find out relationship between achievement in mathematics subject and learning environment of high school students.
3. To find out contribution of attitude towards teaching and learning environment on achievement in mathematics subject of high school students.

HYPOTHESES

Keeping in view of the above objectives, the following hypotheses have been framed:

1. There is no significant relationship between achievement in mathematics subject and attitude towards mathematics of high school students.
2. There is no significant relationship between achievement in mathematics subject and learning environment of high school students.
3. There is no significant contribution of attitude towards teaching and learning environment on achievement in mathematics subject of high school students.

METHODOLOGY

For present study, a sample of 600 students of grade 10^{th} were selected from 10 secondary schools of Kumaun region of Uttarakhand, using simple random sampling technique. To collect data Attitude Toward Mathematics Scale developed and standardized by Rai (2007) and Learning Environment Scale developed by Rai (2007) were used. To analyzed data Pearson's product moment correlation coefficient and regression analysis were used.

RESULTS

To find out correlation of attitude towards mathematics and learning environment with achievement in mathematics, Pearson's product moment correlation coefficient was used. Summary of correlation presented in Table-1. This table shows that value of correlation coefficient between attitude towards mathematics and achievement in mathematics is 0.572. Probability of this correlation coefficient is less than 0.00001. This result indicates that relationship between attitude towards mathematics and achievement in mathematics is positive and highly significant. Thus, null hypothesis that" There is no significant relationship between achievement in mathematics subject and attitude towards mathematics of high school students", is rejected

Table-1: Summary of Pearson's product moment correlation of achievement in mathematics with attitude towards mathematics and learning environment.

	Variables		
Statistics	Achievement in Mathematics	Attitude towards Mathematics	Learning Environment

N	600	600	600
Sum	39452.800	136497.000	109268.000
Sum Squares	2736124.720	31409293.000	20232656.000
Mean	65.755	227.495	182.113
S.D.	15.392	24.410	23.596
Sum of Product with Achievement in Mathematics	----	9104079.200	7256148.400
Correlation with Achievement in Mathematics	----	0.572	0.328
Probability	-----	$p < 0.0001$	$p < 0.0001$

Table-1 also shows that value of correlation between learning environment and achievement in mathematics of high school students is 0.328 with probability less than 0.00001. This means that positive and highly significant correlation exists between learning environment and achievement in mathematics. Hence, null hypothesis that "There is no significant relationship between achievement in mathematics subject and learning environment of high school students", is rejected.

To find out contribution of attitude towards mathematics and learning environment on achievement in mathematics step wise regression analysis was used. Results of step wise regression analysis is given in Table-2.

Table-2: Summary of regression analysis for prediction of achievement in mathematics on the basis of attitude towards mathematics and learning environment

Step	Constant	Multiple R	R^2	Adjusted R^2	Beta Coefficient	Variable	Probability
1	-16.32047	0.57213	0.32734	0.32621	0.572134	ATM	P<0.0000
2	-32.67338	0.60311	0.36374	0.36161	0.329761	ATM	P<0.0000
					0.128541	LENV	P<0.0000
ATM = Attitude Towards Mathematics; LENV = Learning Environment							

It is clearly depicted in Table-2 that at first step attitude towards mathematics entered in regression equation. The value of adjusted R^2 is 0.32621. This indicates that only attitude towards mathematics contribute 32.621% of variance in prediction of achievement in mathematicises. At second step learning environment entered in equation. The value of adjusted R^2 at this step is 0.36161 which indicates that both attitude towards mathematics and learning environment combinedly contribute 36.161% of variance in prediction of achievement in mathematics. This means that attitude towards mathematics and learning environment both are significantly contributing in prediction of achievement in mathematics. Therefore, null hypothesis that "There is no significant contribution of attitude towards teaching and learning environment on achievement in mathematics subject of high school students", is rejected.

DISCUSSION

This study revealed significant and positive relationship between attitude towards mathematics and achievement in mathematics. Previous studies by Aiken (1976), Rosaly (1992), ,Ma (1997), Ma & Xu (2004), Saha (2007), Kadijevich (2008), Khatoon and Mahmood (2010), Sanci (2014), Atanasova-Pachemska *et al.* (2015), Kundu and Ghose (2016), Ajisuksmo and Saputri (2017), Mazana, Montero and Casmir (2019), Bakar and Ayub (2020), and Mertoğlu (2020) findings are supporting findings of present study.

In present study significant and positive correlation was found between learning environment and achievement in mathematics. Previous studies by Adnan *et al.* (2014), Shamaki (2015), Malik and Rizv (2018) and Ndidi and Effiong (2020) findings supporting findings of the present study.

In present study it was found that attitude towards mathematics and learning environment are combinedly contributing 36.161% variance in

prediction of achievement in mathematics. Studies by Moenikia and Zahed-Babelan (2010), Lipnevich, MacCann, Krumm, Burrus & Roberts (2011), Chaudhury and Das (2012), and Ajisuksmo and Saputri (2017) also found that attitude towards mathematics is significant contributor of achievement in mathematics. These studies are in line of present study.

Educational Implication

Present study revealed that significant and positive correlation exists between students' attitude towards mathematics and achievement in mathematics. Therefore, it is responsibility of mathematics teacher to develop positive attitude towards mathematics is secondary school students and thereby mathematics achievement. This study also revealed significant and positive correlation between learning environment and achievement in mathematics. Thus, teachers and principal can improve learning environment in classroom and whole school system to foster learning of students. Teachers can also motivate parents to develop attitude of learner towards mathematics and create good learning environment in home.

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