

The Relationship Between Attitude And Self Efficacy In Mathematics Among Higher Secondary Students

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Abstracts:- This study is based on a survey of Higher Secondary school students about their attitudes towards mathematics and self efficacy in mathematics. Students of different streams (Science, Commerce and Arts) constituted the population of this study. The sample consisted of 784 students both male and female of Class XI selected from 25 schools from southern districts of West Bengal. The tools used were "Mathematics Self Efficacy Questionnaire" adapted from Mathematics Self Efficacy and Anxiety Questionnaire (MSEAQ), (May, 2009), and Modified Fennema Sherman Mathematics Attitude Scale, (Depaken, Lawsky and Padwa, 1993). A correlational study revealed that the association between Higher Secondary students' attitude towards mathematics and self efficacy in mathematics is high. This indicates that a healthy attitude towards mathematics can nurture self efficacy among students.

Key word: Self efficacy, Attitude, Streams, Higher Secondary;

INTRODUCTION

Mathematics is a vital instrument for the conceptualization and application of science and technology. It is an instrument that can be used in our daily lives to overcome the difficulties or problems faced therein (Bishop, 1996). To this purpose mathematics has been considered as one of the most essential subjects in the school curriculum. More mathematics contents are likely to be taught in school and colleges throughout the world than any other subject (A. Orton, D. Orton, and Frobisher, 2004)

Definition of Attitude

Various studies discuss the definition of attitude. Allport (1935) defined attitude as a "mental and neural state of readiness, organised through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related" (p.810). This definition implies that an attitude is a response to certain experience and is formed through life's experiences. Allport's definition denotes the roles that experiences play in the shaping of attitudes. Thus one's repertoire of experiences can be regarded as the basic building blocks of his/her attitude. Thus Allport's view of the function of experience in attitude formation makes his definition immanent for this investigation.

Eagly and Chaiken (1993) defined attitude as "A psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour" (p. 155). This definition appears to focus on the manifestation of attitude. Philips (2003) stated that attitude is protean and based on individuals' beliefs, feelings and values. Thompson (1993) defined attitude as a pattern perceptions developed through one's reaction with the environment.

The above definitions imply that attitude represents one's feeling and reactions to situations. Several studies deal with learners' attitudes towards mathematics. Choudhury & Das (2012), Mahanta, (2014) they show that attitude to mathematics is affected by various factors like gender role stereotyping and beliefs & perceptions about mathematics and affect study habits of students.

Relationship between Attitude and Achievement

Much research has been conducted on the relationship between attitude and achievement. Several studies in western countries show a link between positive attitude and achievement (Iben, 1991; Ma & Nand Kishor, 1997; Tocci & Engelhard Jr., 1991). On the other hand, studies conducted in Asia on Asian students showed that positive attitudes were not always present in students with high achievement scores (Leung, 2002; Stevenson, Chen, & Lee, 1993). While student achievement does not always correlate with a positive attitude, Wilson (2008) recommends that fostering positive attitudes can have long-term beneficial effects. In a study by

Reed, Drijvers, & Kirschner (2010), it was concluded that positive attitudes towards mathematics improved learning styles. The study further stated that the attitude of students played an important role in learning mathematics with computer based learning tools.

Attitude towards Mathematics

Attitude may therefore be simply regarded as a positive or negative degree of sentiment associated with certain experiences. Obviously, it is manifest in a student's outlook on particular subjects of study. Thus attitude towards mathematics may be seen as just a positive or negative emotional predication toward mathematics (Haladyna, Shaughnessy, & Shaughnessy, 1983; McLeod, 1992).

Attitude may not be manifest in overt behaviour. In other words, behaviour signifying particular attitudes may not outwardly apparent. Thus, attitude toward mathematics may be a conglomeration of patterns of beliefs and emotions regarding mathematics (Daskalogianni & Simpson, 2000).

The above discussion points to the fact that attitude is multidimensional, having three components within it: emotional response, beliefs regarding the subject, and behaviour related to the subject. From this point of view, an individual's attitude toward mathematics is delineated by the emotions that he/she relates with mathematics, his/her beliefs towards mathematics, and by how he/she behaves (Hart, 1989). Thus attitudes can be positive or negative. Attitudes play a definite role on students' mathematics achievement. These may be manifest in liking, enjoying and exhibiting interest in mathematics, or the opposite reactions. At worst, math phobia (Ernest, 1989) may ensure. As attitude is associated with academic achievement, it is often considered as a significant variable in educational research (Nkwe, 1985). Ma and Kishor (1997) stated that there is a general belief that children learn more effectively when they are curious about what they learn and that impels them to achieve better in mathematics. There are several studies that discuss the role of attitude in Mathematics learning and achievement. Fogarty, Cretchley, Harman, Ellerton, & Konki, (2001) developed a tool to measure attitudinal factors that play a role in effective use of technology in mathematics learning. Di Martino & Zan, (2010) say that attitude is a multi-dimensional concept and it is never too late to change the student's attitude towards mathematics. Student attitude therefore plays a central role in mathematics learning and achievement (McLeod, 1992). Researchers have also found a strong relationship between positive attitudes and beliefs about mathematics and academic success in mathematics (Ashcraft & Kirk, 2001; Sandt, 2007; Schenkel, 2009; Sherman & Christian, 1999; Tapia & Marsh II, 2004).

A student's attitude towards mathematics can have a positive or negative effect on their learning. This means that a student's attitude could be the critical factor behind his or her success or failure in the subject. Students may develop either positive or negative attitudes towards mathematics from their educational experiences. Positive attitudes generate optimism that is, attributing favourable interpretations to actions and events (Gillham, Shatte, Reivich, & Seligman, 2000). For students, optimism can lead to persistence. Optimistic children are more likely to stay occupied in learning tasks often resulting in enhanced achievement (Wigfield, 1994). In contrast, negative attitudes can enhance maths-anxiety (Trujillo & Hadfield, 1999) and may contribute to poor achievement in mathematics.

Definition of Self Efficacy

Self efficacy is defined as an individual's belief about his/her ability, to carry out a task or perform certain behaviours successfully. Bandura, Barbaranelli, Caprara, & Pastorelli (1996) contend that Self Efficacy can influence a person's life in diverse ways (p. 1206).

Influence of Self Efficacy on Personality Traits

Research has shown that Self Efficacy influences various traits in the personalities of people. Bandura et al., (1996) have argued that qualities such as motivation, perseverance and resilience, and the power think analytically are indications of positive self efficacy. (p. 1206). Thus, just praising the ability of the student will not necessarily induce his/her self efficacy. Rather, the accent should be on praising students' effort and persistence. This is particularly pertinent to the mathematics class. Even if succeeding in mathematics appears to be an uphill task, perseverance in the venture may yield success.

Self Efficacy and Academic Performance

Research shows that self efficacy influences academic performance. Self Efficacy has been shown to be an accurate predictor of success in academic performance (Fast et al., 2010; Multon, Brown, & Lent, 1991). Pajares (2006) in fact showed that twenty five percent of a student's academic success is based on Self Efficacy. Therefore, to ensure students' improved academic achievement, their self efficacy needs to be boosted. Zimmerman (2000) found that students with high self efficacy are eager to learn and are persevering and show more resilience to tackle problems (p. 86). The immediate family may also influence a child's self efficacy. Bandura et al., (1996) found that parents with positive self efficacy often transmit this to their children.

Bandura (1997) stated that self efficacy is the main construct in social learning theory and described it as the disposition of an individual that impels his/her to be successful in specific ventures (Bandura, 1997; Zimmerman, 1995). The four sources of self efficacy are experience, like being successful or unsuccessful;

emotional and physical conditions, like fear, excitement, observing others; experiencing, and witnessing success; and verbal conviction of family, friends and colleagues (Bandura, 1997). Self efficacy beliefs are fed from these sources and affect the performance, exertion of power and the individual's struggles to succeed (Kucukyilmaz and Dubun, 2006). Self efficacy beliefs also affect individual learners' thinking styles and emotional responses. Individuals with high self efficacy levels feel less anxiety and can be more productive. Learners showing certainty in their social skills expect success. Students who are confident about their academic skills expect high grades in examinations and anticipate that the high standard of their work will ensure personal and professional favour. Individuals with low self efficacy levels doubt their social skills and often anticipate rejection or ridicule even before establishing social contacts (Unlu, et al, 2010). Those who lack academic self confidence anticipate low marks even before sitting for an examinations or registering in a course. In sum individuals with high self efficacy levels tend to achieve academic success, and subsequently greater career options. On the other hand, individuals with low self efficacy levels suffer social isolation and even curtailed academic possibilities (Pajares, 2002).

Influence of Self Efficacy on Mathematical Achievement

Self Efficacy has been shown to influence students' mathematical achievement (Bandura et al., 1996; Fast et al., 2010; Pajares, 2005). An individual's mathematical Self Efficacy has been defined as 'a situational, problem-specific assessment of an individual's confidence in her or his ability to successfully perform or accomplish a mathematical task' (Betz & Hackett, 1994). Mathematics Self Efficacy has been shown to be a predictor of behaviour in choosing a career (Hackett, 1985). Hackett (1985) observed that mathematics ability can be a 'critical filter' in career choices for both men and women (Betz & Hackett, 1994). Hodge (1999) found that Math Self Efficacy has is positively correlated with scores in math examinations. Betz and Hackett (1994) reported a moderate correlation between math Self Efficacy and math performance. Hendel (1980) contended that math Self Efficacy, math anxiety, and math performance were highly correlated. In another study on the effect of math anxiety, mathematics Self Efficacy, and performance on a math exam, it was found that small but significant relationships exist among these variables (Hodge, 1999). Moreover, Fast et al., (2010) found that students with low Self Efficacy give up easily when confronted with difficult mathematical problems. Research on self efficacy beliefs of learners has also been undertaken by e.g., Canturk-Gunhan, B. and Baser, N., 2007; Saracoglu and Yenice, 2009; Usher, 2009; Yenilmez and Urgan, 2010. They show that enhanced self efficacy can improve geometry learning and this can even be achieved by interventions like creative activities.

METHODOLOGY

Research Design

The purpose of the study is to determine the relationship between class XI learners' attitude towards mathematics and self efficacy in mathematics. Thus, a co relational research design was used in the process of the study (Basturk, 2009; Baykul, 1999, Fraenkel and Wallen, 2005; Karasar, 2005; Unlu et al, 2010)

Sample

The sample consisted of 784 Class XI learners from 25 schools in two districts of West Bengal, viz., Bankura and South 24 Parganas. Geographical accessibility, proximity and functionality were some of the factors that influenced the choice of the schools. These were urban schools and drew learners from middle socio-economic communities. Formal approval from and all the school Head Teachers were obtained in order to conduct this research. The sample is as follows:

Table 1. The sample

Gender & Streams	Science	Arts	Commerce	Total
Boys	188	124	95	407
Girls	159	181	37	377
Total	347	305	132	784

Instrument

The following are the instruments used in the study:

"Modified Fennema Sherman Mathematics Attitude Scale" (Depaken, Lawsky and Padwa, 1993) consisting of 47 likert type items translated into Bengali. The Test-retest reliability coefficient of the scale is 0.94.

"Mathematics Self Efficacy Questionnaire" adapted from "Mathematics Self Efficacy and Anxiety Questionnaire" (MSEAQ), (May, 2009) consisting of 14 likert type items translated into Bengali. The Test-retest reliability coefficient of the scale is 0.97.

All translated tests were duly validated by experts.

DATA ANALYSIS

The above mentioned two tests were administered on the sample and scored and tabulated. The descriptive statistics and Pearson Product Moment correlation coefficient was calculated to find the relation between Attitude towards Mathematics and Self efficacy in Mathematics variables.

IV. FINDINGS

Both variables, attitude towards Mathematics and Self efficacy in Mathematics were found to be continuous, and tested for normality. They were found to be nearly normal. The following table shows the descriptive statistics for the two variables.

The results are presented in the tables as follows:

Table 2. Descriptive statistics result regarding students, attitude towards mathematics and self efficacy in mathematics

Variables	N	Min score	Max score	Mean	Median	Std. Deviation	Skewness
Attitude score	784	106	228	175.83	177	24.89	-.180
Self efficacy score	784	14	70	50.94	54	12.23	-.633

The relationship between Attitude towards Mathematics and Self efficacy in Mathematics was calculated by the Pearson correlation, as the scatter gram between the two indicated a viable correlation. The following table shows the result of the correlation.

Table 2. Pearson product-moment correlation between attitude towards mathematics score and self efficacy in mathematics.

		Attitude	Self efficacy
Attitude	Pearson Correlation	1	.720**
	Sig. (2-tailed)		.000
	N	784	784

** Correlation is significant at the 0.01 level (2-tailed).

Table 3 shows that the correlation between Attitude towards Mathematics and Self efficacy in Mathematics is positive and highly significant. This shows that good attitude to mathematics can built self efficacy in carrying out mathematical operations and solving problems, and thus enhancing mathematical capability.

DISSCUSSION

The present study shows that the relation between students’ attitude towards mathematics and self efficacy in mathematics is highly significant. This result supports earlier researches indicating a relationship between attitude and self efficacy beliefs (Bindak, 2004; Canturk and Baser, 2007; Pajares and Miller, 1994; Stramel, 2010; Usher, 2009) though in different environments and with different group specifications.

This study, conducted on students in Higher Secondary Schools of West Bengal, shows that self efficacy in mathematics is strongly influenced by attitude towards the subject. In other words, students who are often seen to feel ‘helpless’ when confronted by mathematical situations probably have a mind set of intimidation by mathematics. This is usually an attitude often veering towards a phobia of mathematics, and is built up over the school years (Ashcraft & Kirk,2001). On the other hand students with a positive attitude to mathematics see mathematics as a friendly tool or a challenge (Altuna & Yazici, 2010). This boosts their confidence and thus increases their self efficacy.

This study is of particular importance to teachers who need to be conscious of the trepidations felt by students in the mathematics classroom, and devise pedagogical techniques to counter this. Further, eager students require being motivated to achieve greater mathematical comprehension and power. Mathematics, therefore, requires to be made accessible and enticing to all students.

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