



RESEARCH PAPER

Association between Secondary School Students' Attitude and Achievement in Mathematics: An Empirical Study in Pakistan

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ABSTRACT

The purpose of this study was to gain insight about students' attitude towards mathematics at secondary school level and its association with their academic achievement. The study was conducted by using correlation research design of quantitative approach. Multi-stage sampling technique was used to select 966 respondents from two district i.e. Kasur and Lahore. Firstly, 69 secondary schools were selected through proportionate stratified random sampling. Subsequently, simple random sampling was used to select 14 students from each chosen class. Attitude towards Mathematics Inventory (ATMI) has been adapted as a research tool. Data was analyzed using the Independent T-test sample and the Pearson coefficient of correlation. It is concluded from the overall attitude study of respondents that boys have a more positive attitude towards mathematics than girls. It is recommended that teachers be well-versed of the students' attitude and seek to improve them to have a positive impact on their academic achievement

Introduction

Proficiency in mathematics is necessary to get success in modern society. Students belong to Middle East did not perform well as expected because they are underachieved in mathematics as compared to students from other countries (Ker, 2013). Mathematics is considered as a tool that can be used in our daily life to overcome the difficulties faced (Nicolaidou & Philippou, 2003). Hence, it has been considered as one of the most important core subject in a school curriculum. Subject matter regarding mathematics likely to be taught carefully in schools and colleges as compare to other subjects (Orton & Frobisher, 2004). However, students' achievement in mathematics influenced by the context of personal life, schooling and childcare environments.

In the early 1960s educationists measured the attitude of learners towards different subjects and considered it essential for learning. Most of the teachers believed that attitude is a vital aspect of students' learning and achievement in mathematics. Numerous studies have been conducted in many countries to find the factors that influence on students' achievement in mathematics (Bramlett & Herron, 2009; Mohamed & Waheed, 2011; Mohd, Mahmood, & Ismail, 2011). Researchers concluded that students' attitude towards mathematics is one of the most important factor that have direct and indirect association with students' academic performance (Bramlett & Herron, 2009; Lipnevich, MacCann, Krumm, Burrus, & Roberts, 2011; Mohd et al., 2011). However, some considered that students' attitude towards mathematics might influence the academic achievement of learners (Aunola, Leskinen, & Nurmi, 2006; Turner & Meyer, 2009). Hence, in current situation researchers are interested to find out the students' attitude towards mathematics and its relationship with their academic achievement (Bramlett & Herron, 2009; Köğçe, Yıldız, Aydın, & Altındağ, 2009; Maat & Zakaria, 2010; Tahar, Ismail, Zamani & Adnan, 2010; Tezer & Karasel, 2010). Therefore, aim of this research is to find out the secondary students' attitude towards mathematics and its relationship with academic achievement of Pakistan.

Literature Review

The literature review reveals various research observations and views on the topic attitude of the learner. This expressed various findings of research and reviews related to their subject. Some researchers identified attitude as a key achievement factor in mathematics. In the variety of meanings of Attitude towards Mathematics (ATM) methods suggested among research studies, two main classes can be defined. ATM is essentially a positive or negative psychological inclination towards mathematics by using clear definition (McLeod, 1994). Using a multidimensional definition, ATM consists of three mechanisms: a positive or negative understanding of mathematics, a mathematics concept, and a behavioral tendency to look at mathematics (Hart, 1989). Ma and Kishor (1997) proposes a broader definition; they conceive of a mathematical measure of mathematical risk, a desire to participate in or avoid mathematical practice, a belief in mathematics that is good or bad, and a belief that mathematics is useful or useless "(p. 27).

Ellis (2010) argued that motivation has a positive effect on academic achievement and that both are mutually reciprocal. This leads to an increase in the other if one of them increases. The information gained will benefit educators by helping them learn more about what makes mathematics effective for students. Several researchers concluded that the mindset plays a vital role in mathematics students' learning and academic achievement (Zan & Martino, 2007), as well as a justification for the success and achievement of students in mathematics. This shapes their skill and loves doing mathematics, doing it for a number of tasks assigned. For all available jobs, this practice persists continuously. Generally speaking, students' views of mathematics are the source of their approach to mathematics, which provides them with a way to either take a constructive or non-

productive approach. Students used formal and rule-oriented approach to mathematics in many cases. This is protection from the mathematics wealth knowledge and many methods can be used in the field of mathematics to improve expertise (Mensah et al, 2013).

Ma and Xu (2004) stated in their findings that a decline in mathematics mind-set or way of thinking was associated with low performance. Academic achievement in mathematics is therefore a prerequisite for an active way of thinking. Only a high-quality mind-set in the mathematics direction, however, does not result in excellent results. According to Evans ' 1965 research, attitudes formed by learners when trying to gain knowledge of mathematics tend to remain for a long time in general, and these attitudes can also enable them to learn better mathematics. This occurs when the behavior of the students towards mathematics is good. This may not be true in all cases. However, students also shape adverse attitudes as they learn secondary school mathematics. Nevertheless, both Tapia and Marsh (2004) suggest that students who are able to do mathematics are a cause for excellent attitudes.

The mathematics achievement score of students who took advantage of high self-concept level was significantly higher than those students who had moderate or low self-concept level (Akiba et al., 2008). In addition, Ismail and Anwang (2009) research showed that in both mathematics and science, students who have a positive view of mathematics have shown better grades and academic achievement. According to Khatoon and Mahmood (2010), nearly 54 percent of South African students showed a positive attitude towards the subject of mathematics; when their achievement was lower than the performance of their counterparts in other countries when compared to the international average. Farooq and Shah (2008) concluded no difference between male and female attitudes towards mathematics, because both of them have the same attitude. Their study shows that gender has no effect on students ' attitude towards mathematics in Pakistan.

Chaudhry, Malik, and Rafiq (2019) conducted a study to identify elementary school students' attitude towards learning Mathematics. The population was all the students enrolled in public and private elementary schools of district Lahore. 300 students were selected as a sample through convenient sampling technique. Questionnaire was used to data collection about students' attitude towards learning mathematics. Descriptive and inferential statistics were applied. Results of descriptive statistics showed that most of the students did not feel easy while they are in the mathematics classroom. They did not think that mathematics is beneficial for their practical life. They think that they were good in other things as compare to mathematics, but they felt good if mathematics problems led them to think out of the box. Results of independent sample t-test indicated that male and female students have the same attitude towards

Mathematics. This study also indicated that gender has no effect on students' attitude towards learning mathematics in Pakistan.

Mohamed and Waheed (2011) made a study on secondary school students' attitude towards mathematics of Maldives. The purpose of this study was to find out the students' attitude towards mathematics and investigate the gender difference in attitude towards mathematics. Authors selected 200 secondary school students and administered questionnaire to find out their attitudes towards mathematics. Results showed that students have positive attitude towards mathematics is medium and there is no gender difference in their attitudes. Köğce, Yıldız, Aydın, and Altındağ (2009) examined elementary school students' attitudes towards mathematics in terms of different some variables. The purpose of this study is to determine and compare how the attitudes towards mathematics of students in elementary school changes according to some variables. This study was carried out by using survey method. Mathematics Attitude Questionnaire (MAQ) was used which consists of 37 items each with five response alternatives covering the attitudes of students towards mathematics. Questionnaire was administered on 200 elementary school students selected from two different schools of Trabzon, TURKEY. The data were analyzed by One-Way (Factor) ANOVA and independent-samples t- tests using SPSS. Results revealed that there are statistically significant differences in terms of the attitudes towards mathematics according to their grade levels and gender of students.

In addition, in many studies researchers concluded no significant difference between attitude towards mathematics among male and female students (Mohd et al, 2011; Köğce et al, 2009; Nicolaidou &Philippou, 2003). Hence it can be said that students' attitude towards mathematics are very subjective and varies among the students. Several studies had been conducted to find out the relationship between attitude towards mathematics and academic achievement of the students. Most of these studies showed that there is a positive correlation between students' attitude towards mathematics and academic achievement of students (Mohd et al, 2011; Bramlett & Herron, 2009). The studies has also shown that students attitude towards problem solving in terms of patience, confidence and willingness has a positive relation with students' mathematics achievement (Mohd et al, 2011).

Material and Methods

The approach to conducting the study has been quantitative. In quantitative branch, a correlation analysis format was adopted by the researcher to investigate the relationship between the attitude of secondary school students and their academic success in the subject of mathematics. Population included all the high school students studying in the 10th grade of Kasur and Lahore District during the session 2018-19. Multi-stage sampling technique was applied to draw the sample. Investigators selected 69 secondary schools through proportionate stratified random sampling. The selected schools were split into two categories (boys and girls). Finally, by using simple random sampling, the investigators selected 14

students from each chosen class. Therefore, there were 966 students in the study. The Attitudes to Mathematics Inventory (ATMI) created by Tapia & Marsh in 1996 has been modified to explore mathematics attitudes of students. The ATMI has four underlying dimensions: value (whether mathematical capabilities are worthwhile and needed, 10 items), enjoyment (whether mathematical troubleshooting situations are enjoyable, 10 objects), Self-confidence (expectations as to how mathematics is learned properly and without problems, 15 objects) and motivation (the ability to learn and know more about mathematics, 5 items). The scale has a coefficient of reliability of 0.97 with standard measuring error of 5.67 (Tapia, 1996). Data was collected via ATMI from the researcher's personal visits from the sample of 10th grade students from public sector secondary schools in the district of Kasur and Lahore.

Table 1
Reliability of the Scale

N of Respondents	N of Items	Cronbach's Alpha
50	40	.725

Results and Discussions

Data was analyzed by applying descriptive and inferential statistics using the Statistical Package for Social Sciences (SPSS). Mean scores of respondents are based on ATMI. Pearson's correlation coefficient was calculated to assess the relationship between respondents' attitude towards mathematics and their academic achievement.

Table 2
Distribution of Subjects by Gender and Group

Characteristics	N	Percentage
Gender		
Boys	462	47.82
Girls	504	52.17
Group		
Science	483	50
Arts	483	50
District		
Kasur	322	33.33
Lahore	644	66.67

Table 3
Relationship between Students' Attitude and their Academic Achievement in Mathematics

	<i>Marks</i>	<i>r</i>
Pearson Correlation	1	.335
Sig.		.000
N		966

The results given in the above table show that there is a significant relationship between the overall mathematics attitude of respondents and their academic achievement ($r=0.335$, $n=966$ at meaning level $\alpha=0.000$). This shows that there is a positive and moderate relationship between attitude of students towards mathematics and their academic achievement in the subject of mathematics. There is a relation between the attitude and achievement of 10th grade participants in mathematics, according to the findings. Such findings reflect what is preserved in the literature; it is important for students to have a positive attitude towards mathematics in order to improve academic achievement. Attitudes can be infectious, as in the case of a lady teacher with a poor mathematics outlook, and that feeling spreading to other women in the classroom (Cox, 2010). The diverse findings of this study suggest that educators, especially in high school, need to be aware of the attitudes of students towards mathematics as it may affect their achievement.

A medium level of correlation was certainly correlated with the association between attitude scores and educational success rates. This means that if students have a better attitude, they would probably be better achievers. In comparison, when students have a negative attitude, they are likely to be a low-achievers. In their study, Nicolaidou and Philippou (2013) also concluded that once students have tremendous attitudes towards mathematics, they may gain higher academic scores, reflecting a significant relationship between attitudes and achievement.

Conclusions

Major findings of research determined that majority of the students have a tendency of positive attitude towards mathematics. It is concluded from results that the attitude of respondents towards mathematics was high and it has positive moderate relationship with academic achievement as $r = 0.335$. The relation between these two variables should be known to teachers, students, and other mentors to make sure students feel confident in their math skills and show a better attitude. Teachers also need to be mindful of their attitude because they can have a negative impact on the students.

Recommendations

It is recommended that teachers be aware of and attempt to improve students' attitude in order to positively influence their academic achievement. Efforts should be made by class teachers to ensure that students do not impede gender in mathematics teaching and results. Teachers, parents and siblings must allow male and female students to accept mathematics equally. Teachers should chunk mathematical material into smaller steps, building of skills and scaffold concepts carefully, in this way students can practice each step and concept taught by teacher easily. Schools should give opportunities to students to perform essential activities regarding mathematical concepts to make them master and fluent in computational skills.

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