

# Student attitude towards Mathematics and performance: Does the teacher attitude matter?

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## Abstract

The indispensable role of attitude in the learning of Mathematics has garnered the attention of educational researchers and Mathematics educators for a very long time. Hence, literature is replete with empirical evidence on the relationship between teacher attitude and student academic performance in Mathematics. The study was fashioned to extend the discussion to the influence of teacher attitude on student attitude. The samples for the study were one hundred students and four Mathematics teachers making a total of one hundred and four respondents. The students were randomly selected while the teachers were purposively sampled. Two sets of questionnaires were used to gather data from the respondents after they had been validated and their reliability established. Students' end of term examination scores were used as a measure of students' academic achievements. The study unveiled a significant relationship between teacher attitude and student attitude toward Mathematics. It was realised that teachers' positive attitude radiated confidence in students hence made them develop positive attitude towards the learning of Mathematics. The results of the study were also consistent with existing findings on the relationship between teacher attitude and students' performance in Mathematics. Implications of the findings are discussed and recommendations have been proffered for practice.

**Key words:** Mathematics, teacher attitude, student attitude, student performance, influence and relationship

## Introduction

The competence gain in the study of Mathematics is widely used in all spheres of human life. Mathematics plays a key role in shaping how individuals deal with the various spheres of private, social, and civil life (Anthony & Walshaw, 2009). This justifies the compulsion of the study of the subject by all students who go through basic and secondary education in most countries. Mathematics is therefore a core subject at these levels of education in Ghana. It is regrettable, therefore, that in the contemporary times many students struggle with Mathematics and perform abysmally low in their final examinations in most jurisdictions. In Ghana, students' performance in Mathematics at the Senior High School has not been encouraging of late. Candidates are reported to exhibit poor understanding of Mathematical concepts and are unable to form the appropriate Mathematical models which could be tackled with the requisite skills" (Chief Examiner's Report, 2007). It has also been realised that many students have developed negative attitude towards the study of Mathematics as a result of mass failure of students of the subject. It is an irrefutable fact that the successfulness of learning the subject is contingent on myriad of factors. School, classroom, student and teacher factors all impinge on the learning of Mathematics. In particular, the seriousness or otherwise attached to the teaching of Mathematics invariably affects students' performance in their final examinations.

Educational researchers have expended time and energy trying to unravel the possible causes of students' poor attitudes and performance in Mathematics. An area that has not been explored extensively is the influence of teacher attitude on student attitude towards the study of the subject. Research findings indicate that effective teachers facilitate learning by truly caring about their students' engagement and creating the right atmosphere that enhances student learning (Noddings, 1995). They have high yet realistic expectations about enhancing students' capacity to think, reason, communicate, reflect upon and critique their own practice, and they provide students with opportunities to ask why the class is doing certain things and with what effect (Watson, 2002). The relationships that develop in the classroom become a resource for developing students' attitudes and Mathematical competencies and identities. These resources are very essential to the learning of Mathematics.

Attitude as a concept is concerned with an individual's way of thinking, acting and behaving. It has very serious implications for the learner, the teacher, the immediate social group with which the individual learner relates, and the entire school system. Attitudes are formed as a result of some kind of learning experiences students go through. This is mimicry, which also has a part to play in the teaching and learning situation. In this respect, the learner draws from his teachers' disposition to form his own attitude, which may likely affect his learning outcomes (Yara 2009). Yara (2009) avers that teachers with positive attitude towards Mathematics were inclined

to stimulate favourable attitudes in their pupils. This immediately puts the teacher in the spotlight as one whose attitude, expressed in their behaviour, has a telling effect on students. Teachers' attitude and beliefs play a very significant role in shaping classroom practices (Bolhuis & Voeten, 2004). Does teacher attitude towards teaching significantly predict student attitude towards the learning of Mathematics and enhance students' achievement? Evidence of the relationship between teacher attitude and student attitude towards Mathematics have been anecdotal hence the need to undertake this study for practical evidence.

### **Research Objectives**

The study generally sought to investigate the influence of teacher behaviour on students' attitude towards the learning of Mathematics. Specifically, it sought to determine the relationship between Mathematics teachers' attitudes and students' attitudes toward Mathematics, and identify the effect of student and teacher attitudes on students' performance in Mathematics.

### **Literature and Sources Theories on Attitude**

Attitude is a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour (Eagly & Chaiken, 1993). It is a predisposition or a tendency to respond positively or negatively towards a certain idea, object, person, or situation or an attitude object. Attitude influences an individual's choice of action, and responses to challenges, incentives, and rewards (Business Dictionary). Zelly, Marianne and Elaine (2005) postulate that attitudes are generally positive or negative views about a person, place, thing or event which are often referred to as the attitude object. Arul (1995) quotes Allport's definition of 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. Implicit in the various definitions is that attitude is a psychological orientation developed as a result of one's experiences, which influences how a person views situations, objects or people, and how she appropriately responds to them. The response may be positive or negative; favourable or unfavourable; neutral or ambivalent.

### **Components of Attitude**

Research suggests that there are three different components of attitude. These are the cognitive component, the affective component, and the behavioural component (Eagly & Chaiken, 1993; Maio & Haddock, 2010). The cognitive component of attitude is what the individual thinks or believes about the attitude object. An example is that a person might think that a snake is a dangerous reptile. The affective aspect of attitude is the feelings or emotions of the individual associated with the attitude object. For example, the sight of a snake may evoke the feeling of fear in the individual. The behavioural component is the tendency to respond in a certain way to the attitude object. An example is a person choosing to run away or scream upon seeing a snake. Hence the cognitive, affective and behavioural components of attitude are interrelated and interconnected.

### **Formation of Attitude**

Research has shown that formation of attitude is experiential. People form attitudes through their experiences in life. Social psychology explains how attitudes are formed using three major learning theories which are classical conditioning, operant conditioning and observational learning. Propounded by Ivan Pavlov, classical conditioning is a procedure for modifying behaviour in which repeated pairing of conditioned stimulus with an unconditioned stimulus leads to the development of a conditioned response (Ntim, 2010, Linero & Hinojosa, 2012). Classical conditioning entails neutral stimuli that naturally elicit a response. Children, for instance, become fans of football clubs of their fathers. They grow up believing that those particular football clubs are the best and develop the same passion for the clubs. Hence, we form attitudes according to how we are conditioned or how our experiences condition us.

B.F. Skinner's Operant Conditioning theory is a form of learning in which a response is made in anticipation of a stimulus. In operant conditioning, reinforcement increases the likelihood that behaviour will be repeated (Ntim, 2010). Behaviours that are followed by positive consequences are reinforced and are more likely to be repeated than are behaviours and attitudes that are followed by negative consequences (Moris & Maisto, 2001). Operant conditioning requires the use of reinforcement and punishment. A case in point is if a child's mother smiles at her anytime she picks something up for her, the child begins to realise that it is good to be helpful and she is likely to repeat the behaviour. Conversely, if a mother screams at a child for picking up a puff of a piece of cigarette, the child will grow up having an unfavourable attitude towards smoking and probably those who smoke. This is due to the negative consequence of her action.

Finally, people also learn attitude through observation of people around them, especially if they are people they admire, respect or hold in high esteem. Children therefore invariably observe the attitude of parents and teachers and learn a lot from them. Observational learning theory propounded by Albert Bandura posits that behaviours

are acquired by watching another or the model that performs the behaviour (Yara, 2009). The model displays the behaviour and the learner observes and tries to imitate it. Teachers are, invariably, role models whose behaviours are easily copied by students.

### **Attitude towards Mathematics**

Some authorities regard attitude towards Mathematics as just a like or dislike for Mathematics, while others extend the meaning to embrace beliefs, ability, and usefulness of Mathematics. For Zan and Martino (2007), attitude towards Mathematics is just a positive or negative emotional disposition towards Mathematics. Neale (1969), however, defines attitude towards Mathematics as an aggregated measure of “a 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” (p. 632). Similarly, Hart (1989) considers attitude towards Mathematics from multidimensional perspectives and defined an individual’s attitude towards Mathematics as a more complex phenomenon characterised by the emotions that he associates with Mathematics, his beliefs about Mathematics and how he behaves towards Mathematics. Attitude towards Mathematics includes the tendency to be fearful of and anxious about Mathematics.

Attitude towards Mathematics has cognitive, affective and behavioural components; and like any other kind of attitude, it can be formed through any of the three processes described earlier. A student can develop positive attitude towards Mathematics because he or she learns to associate positive experiences or events with it. Also, positive reinforcement creates room for the formation of positive attitude for Mathematics. And by no means is students’ observation of teachers and teachers’ behaviour especially in relation to Mathematics among the least of the factors that influence their attitude towards Mathematics.

### **Student Attitude towards Mathematics**

The conceptions, attitudes, and expectations of students regarding Mathematics and Mathematics teaching have been considered to be very significant factors underlying their school experience and achievement (Borasi, 1990; Shoenfeld, 1985). In general, the concepts students hold about Mathematics determine how they approach the subject. In many cases, students have been found to approach Mathematics as procedural and rule-oriented. This prevents them from experiencing the richness of Mathematics and the many approaches that could be used to develop competence in the subject.

Attitude can also be gender related. There are many who hold the view that boys do better in Mathematics than girls. This belief tends to affect the attitude of girls towards Mathematics. Farooq and Shah (2008) in a study of secondary school students in Pakistan found that there was no significant difference in confidence of male and female students towards Mathematics at secondary school level. They rather found that students’ success in Mathematics depended on attitude towards the subject. Nonetheless, some studies have found gender difference in students’ confidence in Mathematics. Compared to boys, girls lacked confidence, had debilitating causal attributional patterns, perceived Mathematics as a male domain and were anxious about Mathematics (Casey, Nuttal & Pezaris, 2001). In the study, girls were found to have lower self-confidence in Mathematics than boys.

Instructively, research on the relationship between student attitude and performance has also been inconclusive. Researches that have been conducted to determine the relationship between students’ attitude towards Mathematics and achievement in Mathematics have yielded contradictory results. The findings have thus lacked consistency on the subject. Some studies have demonstrated a strong and significant relationship between Mathematics attitude and Mathematics achievement (Minato & Yanase, 1984, Randhawa & Beamer, 1992, Schenkel, 2009). In the Schenkel’s (2009) study of elementary school pupils, positive correlation between student attitude and student performance was found. Student beliefs and attitudes were found to have the potential to either facilitate or inhibit learning. In a comparative study of factors influencing Mathematics achievement, Burstein (1992) found that there is a direct link between students’ attitudes towards Mathematics and student outcomes. Cheung (1998), in his study of 11-13 year olds, also discovered positive correlation between attitude and Mathematics achievement. The correlation showed that the more positive the attitude, the higher the level of achievement in the student.

Some researches have, however, demonstrated that the correlation between attitude towards Mathematics and achievement in Mathematics was rather weak and could not be considered to be of practical significance (Vachon, 1984; Wolf & Blixt, 1981). In a meta-analysis of 113 primary studies involving elementary and secondary school children, Ma and Kishor (1997) found that attitude towards Mathematics and achievement in Mathematics was positively and reliably correlated but not strong. The correlation was not statistically significant. Flowing from the preceding findings, studies in different cultural settings are eminent to realise the influence of student attitude towards Mathematics on student learning outcomes in the subject.

## Teacher Attitude towards Mathematics

An understanding of how attitudes are learned should establish a connection between teachers and students' attitudes, and attitudes and performance. Schofield (1981) reports that positive teacher attitude towards Mathematics was significantly related to high achievement in pupils. Bridget, Vemberg, Twemlow Fonag, and Dill (2008) studied how the teachers' attitude contributed to students' academic performance and behaviour. The study unveiled, among other things, that students with more devoted teachers were regarded by their peers as helpful to victims of bullying relative to students with less devoted teachers. The study also disclosed that students with the devoted teachers had the courage and determination to face difficulties in school life. Teachers were recognised as those who provided support, encouraged students and their value for love eradicated unwanted behaviour in students. Teachers are, invariably, role models whose behaviours are easily copied by students. What teachers like or dislike, appreciate and how they feel about their learning or studies could have a significant effect on their students. Unfortunately however, many teachers seldom realize that how they teach, how they behave and how they interact with students can be more paramount than what they teach (Yara, 2009).

Like all other kinds of attitude, a teacher's attitude towards Mathematics can be measured by the emotional response towards Mathematics (affective), beliefs about Mathematics (cognitive), as well as behaviour. Clarke, Thomas and Vidakovic (2009) postulate that attitudes and practices of teaching Mathematics are complexly affected by beliefs, emotions, social context and content knowledge. Studies confirm that emotional responses toward Mathematics that are found in teachers include like and dislike of Mathematics, anxiety associated with Mathematics and self-confidence in relation to Mathematics (Phillipou & Christou, 1998, Brady & Bowd, 2005, Henderson & Rodrigues, 2008). These emotional factors have been found to have an impact on student performance. In their study of teachers' self-esteem connected to Mathematics, Henderson and Rodrigues (2008) found that approximately half of the participating pre-service teachers, some of whom were highly qualified, lacked self esteem in relation to Mathematics. Burks, Heidenburg, Leoni and Ratliff (2009) stipulate that teachers' exhibition of self confidence when teaching Mathematics motivates student achievement in Mathematics. The learner draws from the teacher's disposition to form his own attitude which may affect her learning outcomes.

Teachers' beliefs about Mathematics such as the usefulness of Mathematics, the way Mathematics should be learned, the difficulty or ease of Mathematics, as well as gender ability and beliefs also affect their attitude towards the subject and impact on students' performance. According to Philippou and Christou (1998), teachers' beliefs about the utility of Mathematics are often found to correlate with either a more positive or negative attitude towards the subject. It is believed that a teacher who sees no usefulness of Mathematics in the real world and believes that Mathematics should be learnt as a set of rules and algorithms will require his students to memorise procedures and rules without meaning. This is a negative outlook that will make his students develop a negative attitude towards the subject. Also, a teacher who believes that girls are poor in Mathematics is likely to impact negatively on girls in his class who will begin to believe that they cannot do Mathematics.

Another aspect of the teacher's attitude towards Mathematics is the teacher's behaviour in relation to Mathematics. Such Mathematics-related behaviour as avoidance of Mathematics, pursuit of Mathematics and instructional behaviour in the classroom all affect student attitude and performance. Usually, the way that Mathematics is represented in the classroom and perceived by students, even when teachers believe they are presenting it in authentic and context dependent way stands to alienate many students from Mathematics (Barton, 2000, Furinghelti & Pekhoren, 2002). Ogunniyi, as cited in Yara, (2009) stipulates that students' positive attitude towards Mathematics is enhanced by the following teacher-related factors: teachers' enthusiasm, teachers' resourcefulness and helpful behaviour and teachers' thorough knowledge of the subject-matter and their making Mathematics quite interesting. It is inferred that teachers can foster in students the positive attitudes about Mathematics that help to build confidence by: encouraging the belief that everyone can "do" Mathematics – emphasizing effort, not innate ability; modelling enthusiasm for teaching and learning Mathematics; addressing the learning styles of students by providing a variety of ways for students to gain an understanding of difficult concepts; helping students to appreciate the value of Mathematics in their lives; and choosing activities carefully (not too easy, not too hard), so that students can be both challenged and successful (Ministry of Education, Ontario (2004).

### Hypotheses

To achieve the objectives of the study, the following hypotheses were formulated:

H<sub>0</sub>: There is no correlation between teacher attitude and student attitude towards Mathematics

H<sub>0</sub>: There is no correlation between student attitude and student performance in Mathematics.

$H_0$ : There is no correlation between teacher attitude and student performance in Mathematics

### Methodology

Descriptive survey design was adopted for the study. The student-sample for the study was drawn from the 2<sup>nd</sup> and 3<sup>rd</sup> year classes of Senior High Schools. The teacher-sample was made up of those who had taught the students for at least a year. It was envisaged that the three terms of interaction between the teachers and the students afforded them the opportunity to know each party well so as to provide reliable data about each others' attitude toward the subject.

Two sets of questionnaires were used to gather data for the study. Most of the items on the questionnaire were Likert type. The questionnaire for the students was adapted from Attitude towards Mathematics Inventory, an instrument developed by Tapia and Marsh II (2004). It consisted of 21 items measuring students' attitudes toward Mathematics. The questionnaire for teachers was adapted from the Mathematics Teacher Questionnaire of the Third International Mathematics and Science Studies-Repeat (1999). It consisted of 12 items measuring teacher attitude towards Mathematics and 5 items eliciting data on what teachers perceived to be the attitude of students towards Mathematics. A study of the end of term scores of the selected students provided data on the academic performance of students in Mathematics.

The face validity of the instruments was ascertained through peer review. Pre-testing of the instruments was done to ascertain their reliability. Cronbach reliability test yielded coefficient alpha of 0.87 and 0.798 respectively for the students and teachers' questionnaires. The data were analysed by the use of SPSS version 16 using descriptive and inferential statistics.

### Results and Discussion

The study focused on the correlation between teacher attitude and student attitude toward learning Mathematics. The study sought to find out the attitude of the Mathematics teachers as perceived by the students. The questionnaire for teachers comprised 12 items based on a 5-point likert scale with a total score of 60 measuring their attitude towards Mathematics. An attitude score of less than 36 was considered negative and a score of more than 36 considered positive. A score of 36 was a neutral point. The results demonstrated that all the teachers had positive attitude towards Mathematics based on their attitude score. A mean attitude score of 49.5 was recorded, indicating a high positive attitude score.

To test the hypotheses, correlation coefficient was computed using Pearson Product Moment Correlation Coefficient. Correlation between teacher attitude and student attitude was computed and the results are displayed in Table 1.

$H_0$ : There is no correlation between teacher attitude and student attitude toward Mathematics

**Table 1: Correlation between Teacher Attitude and Student Attitude**

Correlation	
Pearson Correlation	0.310**
Significance (2-tailed)	0.002
N	100

The test of the hypothesis at 95% (0.05 significance level) confidence level revealed a significant Pearson Correlation Co-efficient of 0.31. The results show a positive and significant correlation between teacher attitude and student attitude. Therefore, the null hypothesis is rejected and it is concluded that a significant positive relationship exists between teacher attitude and student attitude towards Mathematics. This affirms Yara's (2009) assertion that teachers with a positive attitude towards Mathematics are inclined to stimulate favourable attitudes in their students. The results of the study establish a positive and significant correlation between teacher attitude and student attitude. If teachers positively condition students toward Mathematics, students would have positive predisposition for the subject. Again, if teachers exhibit positive behaviour and give good utterances about Mathematics, students would imitate that behaviour and hence develop positive attitude towards the study of this all-important subject.

$H_0$ : There is no correlation between student attitude and student performance in Mathematics. The results are presented in Table 2.

**Table 2: Correlation between Student Attitude and Student Performance**

Statistics	
Pearson Correlation	0.419**

Significance (2-tailed)	0.000
N	100

From Table 2, the test of the hypothesis at 95% (0.05 significance level) confidence level revealed a correlation of 0.419. This means that at the 0.05 significance level, a positive and significant correlation exists between student attitude and student performance, therefore we reject the null hypothesis. The results of the research support the findings of studies conducted by Burstein (1992), Chueng (1998), and Schenkel (2009), among others, which found a positive and significant correlation between the attitude of student and their performance in Mathematics. According to these studies, the performance of students in Mathematics is significantly related to the attitude of the students towards Mathematics. By virtue of its findings, this research has joined the school of thought that relates student attitude significantly to student performance.

$H_0$ : There is no correlation between teacher attitude and student performance in Mathematics. The results are shown in Table 3.

**Table 3: Correlation between Teacher Attitude and Student Performance**

Pearson Correlation	0.015
Significance (2-tailed)	0.879
N	100

As displayed in Table 3, the test of hypothesis at 95% (0.05 significance level) confidence level revealed a weak correlation of 0.015. Thus, per this study, even though there is a positive correlation between teacher attitude and student performance, the correlation is insignificant. Hence, we fail to reject the null hypothesis. Concerning teacher attitude and student achievement, even though this research has supported other research findings in terms of teacher attitude influencing students' attitude, it failed to establish a significant link between teacher attitude and student performance. This could be due to the fact that the performance of students depends on a combination of factors rather than just the attitude of the teacher. Hence, even though the teacher's attitude does have an influence on student outcome, it is not the only factor.

### Conclusions and Recommendations

The study has disclosed that the attitudes of the Mathematics teachers were related to the attitude of the students towards the subject. A significant relationship was found between teacher attitude and student attitude towards Mathematics. This connotes that irrespective of the Mathematical capability of students if teachers display negative attitude towards Mathematics students may not develop positive attitude towards the subject and vice versa. The positive the attitude of Mathematics teachers towards the subject, the positive the students' attitude towards the study of the subject. The attitude of the teacher resonates in the attitude of her students toward the subject. Teachers' attitude towards Mathematics, therefore, matters as it has a powerful influence on student attitude formation.

The positive correlation between students' attitude and students' performance, and teacher attitude and students' performance in Mathematics further demonstrate that attitude plays a central role in student learning. Particularly, teachers' attitude toward teaching Mathematics is seen as an important factor in the formation of students' attitude towards the learning of the subject. Mathematics teachers can therefore positively influence students' attitude towards Mathematics by demonstrating positive attitude towards the teaching of the subject in class.

It is, therefore, important and imperative for Mathematics teachers to develop positive attitude towards the subject and make Mathematics interesting and appealing to students in order to help them develop a positive attitude towards it. Mathematics teachers ought to create interesting and non-threatening environments in their Mathematics classroom and model enthusiasm for the teaching and learning of the subject. This may go a long way to help students develop positive attitude towards the subject, learn it without any inhibition and hence improve their performance.

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