STUDENTS' ATTITUDES TOWARDS MATHEMATICS

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ABSTRACT

Students in their transition between primary school and secondary school are likely to experience adaptation issues in terms of teaching approaches and perceptions towards the new curriculum. Teachers' effort in assisting the students to adapt to the change becomes easier if they are provided with information about the students' attitude towards the new learning experience. This study investigated students' attitudes towards the learning of mathematics. An attitude scale instrument was distributed to 63 Form One students who participated in the study. The overall findings revealed that most of the students showed moderate positive attitude towards mathematics. This has implications for higher education institutions involved in the training of mathematics teachers.

Keywords: *attitudes, mathematics, students*

INTRODUCTION

Students' mathematics achievement has become a major concern especially among those involved in the field of mathematics teaching and learning. Studies have been carried out looking at factors that cause difficulties in solving mathematical problems. The factors are classified into dimensions of student personal variables, instructional variables and environmental variables (Walberg, 1981; Meece, Wigfield & Eccles, 1990; Akinsola & Olowojaiye, 2008). Apart from that, there have also been studies which

compared students' achievement in mathematics by looking at factors such as gender, student background and approaches used in teaching (Tapia & Marsh, 2001; Yimaz, Altun & Olkun, 2010). For instance, studies by Walberg (1992) and Tsai and Walberg (1983) revealed that students' achievement and attitude towards mathematics are dependent on quite a number of different variables. In addition, the focus on lifelong learning emphasises the need to develop mathematical skills within each individual, in order to achieve significant improvement or become more competent in mathematics. Findings revealed that more effort is needed in order to assist students in achieving better results in the area of mathematics learning (Yimaz, Altun & Olkun, 2010).

It is a known fact that there are differences in terms of approaches of mathematics content delivery between secondary and primary schools. Students who are in their first year in secondary school need to adapt to secondary school learning environment. Hence, if these students are able to get assistance to adapt to the learning environment, they may become successful in their learning. Individual adaptation to the environment will result in different attitudes towards learning. Wilkins and Ma (2003) emphasized that the variables of attitude change at different stages of secondary school. The attitudes are significant to be observed since there is correlation between school achievement and students' attitude in learning mathematics (Mohd et al., 2011; Muhammad & Syed, 2008; Papanastasiou, 2000). In view of the aforementioned discussion, this study was conducted to investigate the level of attitude towards mathematics among secondary school students, focusing on the general overall attitude and also three specific domains: affective, behavioral and cognitive.

The research questions are:

1. What is the students' overall attitude towards mathematics?
2. What is the students' attitude towards mathematics in terms of affective domain?
3. What is the students' attitude towards mathematics in terms of behavioral domain?
4. What is the students' attitude towards mathematics in terms of cognitive domain?

LITERATURE REVIEW

The term attitude has various definitions as it depends on the purpose of what we are using it for (Zan & Martino, 2007; Akinsola & Olowojaiye, 2008). The word attitude refers to manners, dispositions or feelings that one has towards another person or a given object. Most of the time people experience feelings such as love, hate, dislike, like, agree and disagree and all of these feelings are evaluative responses to an entity or object. Hence, attitude is known as a description for evaluation of a specific object in mind (Bohner & Wanke, 2002). Meanwhile, according to Eagly and Chaiken (1998), attitudes are often regarded as beliefs. On the other hand, psychologists define attitude as a tendency to evaluate things in certain ways. It includes evaluations of people, issues, objects or events and that evaluations can either be positive or negative. Generally, attitudes are examined as an evaluation of people's way of dealing with objects or situations as well as issues (Greenwald, 1989, Petty & Cacioppo, 1986). When studying the attitude of an individual, one can predict the individual response to an object or situation (Ajzen & Fishbein, 1977) as positive attitude ensues a positive response whilst negative attitude ensues a negative response.

Exposure to students' attitudes towards learning mathematics is important since cognitive process in mathematical thinking is guided by students' attitudes. In other words, students involve their feelings and reactions in solving mathematical problems. The reactions illustrate individual behavior in dealing with objects or situations such as when solving problems in mathematical questions. Since the reaction involves thinking, attitude towards mathematics also involves the cognitive process. Since attitude is related to feelings, behavior and cognitive process, it can be classified into three separate categories, which are affect (feel), cognition (think) and behaviour (behave) (Ajzen, 1988; Eagly & Chaiken, 1998; Bohner & Wanke, 2002).

Attitude towards mathematics has been studied from many different aspects. The major aim of these studies focuses on students' development in the context of mathematics learning. Apart from that, the findings also aim to provide input on the way how mathematics curriculum helps students in preparing themselves to manage their everyday life challenges,

and in the future help students to major in suitable careers related to science and technology. Several studies have also been done to find the factors affecting students' performance in mathematics. One of the many factors discovered is students' attitude (Papanastasiou, 2000; Mohd et al., 2011; Ma & Kishor, 1997).

Studies have shown that a positive attitude is favorable for good performance and also verified that there is a significant correlation between attitude and achievement (Papanastasiou, 2000; Mohd et al., 2011; Ma & Kishor, 1997). The positive correlation here means that when the attitude of students is increasing (positive), therefore their achievement will increase too. Studies also revealed that prediction of mathematics achievement was significantly predicted by extreme positive or negative attitudes than more neutral attitudes (Bergeson, Fitton & Bylsma, 2000). However, according to Ghanbarzadeh (2001) and Scott (2001), the relationship between students' attitude and their achievement should not be interpreted explicitly. Kiely (1990) showed that on average, a small number of students with positive attitude performed well in mathematics. Meanwhile, Ghanbarzadeh (2001) and Scott (2001) reported that although there is a relationship between attitude and achievement, this relation should not be considered definite, especially for the students who are in their transition from primary education to secondary education. Thus, it is crucial to investigate Form One students' attitude in learning mathematics. The major difference is the students in primary school receive a lot of help from teachers (Borthwick, 2011). This may contribute to the difference in attitude towards mathematics among Form One students in secondary schools.

Based on the Multicomponent (Tripartite Model) model of Attitude (Eagly & Chaiken, 1998; Hovland & Rosenberg, 1960) attitude can be categorized into three components: affective, behavioral and cognitive (Bohner & Wanke, 2002). Brief explanations for the three components are as follows:

1. Affective (Emotion): Your feelings about an object, person, issue or event.
2. Behavioral (Act): Your behavior which is influenced by your attitude.
3. Cognitive (Thinking): Your thoughts and beliefs about a subject.

METHODOLOGY

Quantitative approach was employed in this study to examine the level of attitude towards mathematics in terms of the three domains, namely affective, behavioral and cognitive. The survey method (questionnaire) was the fundamental research design for this study. The Likert-Scale type of questionnaire was distributed to the respondents involved in the study. The population of this study was Form One students from a secondary school in Shah Alam, Selangor, Malaysia. Using the simple random sampling technique, 63 students were chosen as the sample from the six Form One classes in the school.

The questionnaire used in this study was adapted from the Fennema-Sherman Mathematics Attitude Scales (1976) to meet the needs for this study. It was divided into two parts: Part A focused on the demographic data of the students while Part B focused on the three main variables which formed the core issues investigated in this study (affective, behavioral and cognitive domains). Students had to respond to the statements in the questionnaire using the Likert scale (1-10) where number 1 was the lowest and number 10 was the highest score given, all of which was used to measure the level of attitude towards the statements.

FINDINGS

The results were analyzed descriptively to answer the following research questions.

Research Question 1: What is the students' overall attitude towards mathematics?

Research Question 2: What is the students' attitude towards mathematics in terms of affective domain?

Research Question 3: What is the students' attitude towards mathematics in terms of behavioral domain?

Research Question 4: What is the students' attitude towards mathematics in terms of cognitive domain?

Table 1 shows the means and standard deviation for the overall mean of the attitude as well as means for the domains of attitude. The overall mean and standard deviation were 6.67 and 1.51 respectively. Thus, the outcome for research question one indicated that the overall mean for 'attitude' was 6.67. It was higher than 5.50 (middle point of the domain).

Table 1: Mean Score and Standard Deviation for Domains of Attitude

Domain	Mean	Std. Deviation
Affective	7.36	1.61
Behavioral	5.62	1.72
Cognitive	6.97	1.54
Attitude (overall)	6.67	1.51

Descriptively, the results show that the mean of the affective domain (mean = 7.36, standard deviation =1.61) was the highest among the domains. Thus, the outcome of research question two indicated that descriptively, students' attitude level towards mathematics in terms of affective was higher than the overall mean attitude and the highest among the domains.

Next, descriptively, the results show that the mean of behavioral domain (mean = 5.62, standard deviation =1.72) was the lowest among the domains. Thus, the outcome of research question three indicated that descriptively, students' attitude level towards mathematics in terms of behavioral was the lowest among the domains.

Last, descriptively, the results show that the mean of cognitive domain (mean = 6.97, standard deviation =1.54) was the closest to the overall mean. Thus, the outcome of research question four indicated that descriptively, students' attitude level towards mathematics in terms of cognitive was average among the three domains.

In conclusion, the results show that on average, the mean score for attitude was descriptively higher than the middle point of the scale. Descriptively, the results revealed that the students showed the highest level of attitude towards mathematics in terms of affective domain and the lowest in behavioral domain.

For further description, the results of the items for the affective domain are presented in Table 2. The means for all items represented positive values. All values for the negative items for example, "Learning mathematics is a waste of time" were converted to positive value. If the value of data was 10, then it was converted to 1. The scores of the negative items were reversed before the analysis was carried out.

Table 2: Items for Affective Domain

Affective Domain	Mean	Std. Deviation
*Learning Mathematics is a waste of time (the data was reversed to positive).	8.40	2.167
I learn Mathematics well.	6.95	2.196
I enjoy learning Mathematics.	6.76	2.532
I prefer that more time is allocated for Mathematics in the school time table. The students interpreted that learning Mathematics is worthwhile.	5.35	2.754
*Mathematics is boring (the data was reversed to positive).	7.59	2.607
It is important that students learn Mathematics since Year 1.	8.24	2.454
What I learn in Mathematics will be important when I further my study at the degree level.	8.43	2.421
*Mathematics is hard for me (the data was reversed to positive).	6.17	2.366
Mathematics is a worthwhile subject.	7.43	2.388
Mathematics is a necessary subject.	7.73	2.573
*When I hear the word Mathematics, I dislike it (the data was reversed to positive).	8.30	2.219
Mathematics does not scare me at all.	6.92	2.853
Overall	7.36	1.61

*Negative items

The data for the item "When I hear the word Mathematics, I dislike it" was reversed to positive values to indicate the statement "When I hear the word Mathematics, I like it" (M=8.30, SD= 2.219). The results showed that descriptively, the mean was higher than the overall mean of 7.36 for affective domain. Other items in the affective domain which showed a higher mean than the overall mean are as listed as follows:

1. What I learn in Mathematics will be important when I further my study at the degree level, with mean = 8.43.

2. Learning Mathematics is a waste of time (the data was reversed to positive value which became "Learning mathematics is not a waste of time") with mean = 8.40.

3. When I hear the word mathematics, I dislike it (the data was reversed to "When I hear the word mathematics, I like it"), with mean=8.30.

4. Mathematics is a necessary subject, with mean=7.73.

5. The students interpreted that learning mathematics is worthwhile, with mean= 7.59.

The results showed that the students put across the importance of learning mathematics and they emphasized the significance of learning mathematics.

Table 3 shows the results for items for behavioral domain. Only one item in the behavioral domain was reversed to positive value, namely "I never avoid myself from doing more exercises in mathematics in school" (M=6.94, SD=2.879). The results showed that descriptively, the mean was higher than the overall mean (5.62) for behavioral domain. Other items in the behavioral domain which showed a higher mean than 5.62 are as listed below:

1. I need to do a lot of mathematics exercises, with mean=7.35.

2. I will study hard for my Mathematics in order to get a good job, with mean=7.10

3. I always ask the teacher when I do not understand a Mathematics topic, with mean = 6.51

The results showed that the students were aware of the need to be engaged in the learning of Mathematics. Nevertheless, their effort was less as the results showed descriptive lower mean in most of the items on actions taken in the behavioral domain.

Table 3: Items for Behavioral Domain

Behavioral Domain	Mean	Std. Deviation
I need to do a lot of Mathematics exercises.	7.35	2.824
I will do extra Mathematics exercises than the ones already given in class.	5.49	2.264
I revise more on Mathematics topics compared to other subjects.	4.13	1.955
I always ask the teacher when I do not understand a Mathematics topic.	6.51	2.596
I learn the Mathematics topics first before attending class.	4.40	2.543
I am interested to talk to my Mathematics teachers about a career that applies Mathematics.	4.86	2.717
I have talked to my Mathematics teachers about a career that applies Mathematics.	4.21	1.902
I will study hard for my Mathematics in order to get a good job.	7.10	2.832
I am willing to learn more than the required amount of the contents in Mathematics.	5.08	2.478
I plan to learn Mathematics as much as I can during my education.	5.78	2.948
*I avoid doing more exercises in Mathematics in school (the data was reversed to positive).	6.94	2.879
Overall	5.62	1.72

*Negative items

Table 4 shows the results for items in the cognitive domain. Only three items showed means lower than the overall mean (6.67) for cognitive domain. The items are as below:

1. I try to relate Mathematics with my everyday life, with mean=6.37.

2. I don't expect to use Mathematics after leaving school (the data was reversed to "I expect to use Mathematics after leaving school"), with mean =6.02.

3. I make a lot of errors when I calculate Mathematics problems (the data was reversed to "I make less errors when I calculate mathematics problems"), with mean=5.40.

The results showed that descriptively, the students were aware of their thinking about Mathematics, but their confidence level needed to be improved.

Table 4: Items for Cognitive Domain

Cognitive Domain	Mean	Std. Deviation
*I make a lot of errors when I calculate Mathematics problems (the data was reversed to positive).	5.40	2.393
I can learn Mathematics.	7.32	2.539
What I learn in Mathematics is useful outside class.	7.63	2.438
When I learn Mathematics, I will use it in my everyday life.	7.13	2.406
*Mathematics is not related to the field that I will be involved in (the data was reversed to positive).	6.97	2.851
I try to relate Mathematics with my everyday life.	6.37	2.364
*I don't expect to use Mathematics after leaving school (the data was reversed to positive).	6.02	2.359
*I don't plan to use Mathematics after leaving school (the data was reversed to positive).	7.38	2.854
I'll need Mathematics for my future work.	7.51	2.546
I believe studying Mathematics helps me with problem solving in other areas.	7.05	2.498
Mathematics helps develop the mind and teaches a person to think	7.92	2.567
Overall	6.67	1.54

*Negative items

CONCLUSION

In conclusion, the overall findings revealed that most of the students showed moderate positive attitude towards Mathematics. Specifically, the students showed the highest level of attitude towards Mathematics in affective domain and the lowest in behavioral domain. In terms of affective domain, further analyses showed that even though the students liked Mathematics and they involved themselves in thinking, as well as found it an important subject, they clearly did not make the effort to do well in this subject as discovered in the behavioral domain. In terms of

affective domain as well as cognitive domain, the students were more ready compared to behavioral domain. In view of this, teachers' effort is needed since the behavioral domain, i.e the students' effort in practicing mathematics problems was related to teachers' preparation with regard to materials used and input given in classrooms (Yilmaz, Altun & Olkun, 2010). Hence, the increase in the number of mathematical tasks practices is required among secondary school students during the duration of their study. The need for practice is emphasized since students' attitude will change at different stages of secondary school (Wilkins & Ma, 2003). These findings have implications for higher education institutions involved in the training of mathematics teachers to raise their awareness on the attitudes of students in learning Mathematics.

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