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An Investigation About 6th Grade Students' Attitudes Towards Mathematics

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Abstract

The purpose of this study is to investigate 6th students' attitudes towards mathematics, the gender effect on attitude and the relationship between attitude and achievement. The data were collected from 120 6th grade students. Participants were assigned to complete mathematics attitude scale which is developed by Aşkar (1986). In addition students were grouped as low, medium and high achiever with respect to their grades. Students' attitude scores were computed, descriptive statistics were examined and scores were compared with respect to achievement and gender. The results indicated that students have relatively positive attitudes towards mathematics. The difference between high and low achiever students' attitude scores is significant. Hence there is a relationship between attitude and achievement. On the other hand no gender difference was found in this study.

Keywords: Mathematics, attitude, achievement, gender

1. Introduction

Mathematics learning generally seems as a cognitive process. However, as Maker (1982) indicates that almost in every context, differentiating affective and cognitive domains is very difficult. In every constructs, there are both cognitive and affective components (as cited in Ma, Kishor, 1997). As almost in every construct, in learning mathematics affective variables have important roles. Students' perceptions and feelings about mathematics indicate their future preferences, persistence on a given task, way of studying, and participation of the classroom activities. For example, if a student has a positive attitude toward mathematics s/he will more enjoy in mathematics classes and participate more voluntarily which affect his/her achievement (Reyes,1984). Indeed, affective factors can estimate

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students' future learning and future success (Hannula, Opt'Eynde, Schlöglmann & Wedege, 2007). In general, affective domain composed of beliefs, attitudes and emotions (Ma, Kishor, 1997). In this study the construct of attitude towards mathematics was investigated which is an important factor in teaching and learning mathematics.

In theory, it is assumed that there is a strong positive relationship between attitude and achievement. Besides the studies supporting these view, there are also some studies indicated that there is no or insignificant relationship between attitude and achievement. In their meta-analysis, Ma and Kishor (1997) indicated that there is a statistically significant relationship between attitude and achievement but effect size is low. It is argued that there should be significant relationship between attitude and achievement. The purpose of this study was to investigate the relationship between attitude and achievement. In this respect study may contribute the literature with different samples.

1.1. Attitude

Research on attitude goes back to the 1930s with the Allports's study about individuals' choices about voting, buying goods etc. These initial studies mainly rooted on the social psychology. Then researches continued about theoretical definition and measurement instruments of attitude (Martino,Zan 2007). With the construction of the belief that 'attitude plays a crucial role in learning mathematics' (Neala, 1969), it becomes an important research area in mathematics education (as cited in Martino & Zan 2007). Oskamp (1977) explains several reasons why attitude research is so important. First of all attitudes can explain the reasons of many behaviors. It also indicates the consistency of that behavior. Secondly, attitudes reflect persons' perception of the world. Third, it includes clues about unconscious determinants of the behaviors. Lastly attitude is basis for all social behavior. In general attitude is perceived as the hidden reason of people's behavior towards an object, issue or person.

In the literature there are many definitions of the attitude. According to Oskamp attitude is "a person's bodily position or posture" (1977, p.7). It can be inferred in this definition that it is posture of the mind. Aiken (2000) referred to attitude as 'a learned predisposition or tendency on the part of an individual to respond positively or negatively to some object, situation, concept, or another person'. In Aiken's definition it is emphasized the learned aspect of the attitude. Allport also mentions the learned aspect and define attitude as "a mental and neural state of readiness, organized through experience, exerting a directive or dynamic influence upon an individual's response to all objects and situations with which it is related" (1935, p. 810. It can be inferred from these definitions that attitudes are predispositions and they are learned. In addition to these characteristics the evaluative aspect of the attitude also mentioned in the literature and Fishbern and Ajzen (1975) gave a more comprehensive definition as "a learned predisposition to respond in a consistently favorable or unfavorable manner with respect to a given object" (p.6). From these definitions, it can be concluded that attitudes are predispositions which are learned, and they are relatively consistent.

Attitude towards mathematics is also specifically defined in the literature. Neale (1969) defined attitude toward mathematics as "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"(as cited in Ma, Kishor, 1997, p.27). McLeod defined attitude towards mathematics in a simpler way as **"**a positive or negative emotional disposition toward mathematics". Hart describes attitude towards mathematics as emotions and beliefs that an individual associates with mathematics (as cited in Martino & Zan 2007, p158). Therefore attitude towards mathematics is described as both in terms of emotions and beliefs.

In theory, it is assumed that there is a strong positive relationship between attitude and achievement. Besides the studies supporting these view, there are also some studies indicated that there is no or insignificant relationship between attitude and achievement. In their meta-analysis, Ma and Kishor (1997) investigated the results indicated in the literature about achievement and attitude. The results show that there is a statistically significant relationship between attitude and achievement but effect size is low. The reason of low effect size contributed to the low quality of the measures of attitude. It is also indicated that some mediating variables may affect the results of the studies. It is argued in the study that there should be significant relationship between attitude and achievement. In this study it is investigated that whether there is a relationship between students' achievement and attitudes towards mathematics. The aim of this study was to examine 6th grade student' attitudes towards mathematics, the relationship between attitude and achievement; and attitude and gender.

2. Methodology

The purpose if this study was to describe 6th grade students' attitudes towards mathematics and investigate the relationship between attitude and achievement and attitude and gender. As this study investigates the variables that students already have, it is a causal comparative research design (Franken, Wallen, & Huyn, 2012). The data was collected by mathematics attitude scale (MAS) which was developed by Aşkar in 1989. This scale was conducted in order to learn students' attitudes and feeling towards mathematics. Convenient sampling procedure was used in this study. School was selected as it is accessible for the researcher. Data were collected from 130 6th grade students. However in the 5 students' answers, it is detected many inconsistencies. Therefore, these students were removed from the analysis. Hence the analysis was made by the data taken from 125 students. 54 % of the participants were female and 46 % were male. The school located in Pursaklar in Ankara. In general students came from families with low socio economic status

2.1. Measuring Instrument

In this study mathematic attitude scale (MAS) was administered as measuring instrument. The scale was developed by Aşkar (1986). The scale was composed of 20 items, ten of the items indicate positive and ten of them indicates negative attitude. It is composed of with 5 point Likert scale from 'totally suitable' to 'never suitable'. The maximum score that can be taken from the scale is 100 and minimum score is 20. The scale was taken from the thesis of Yıldız (2008). In the literature the scale was used in many studies and it is valid and reliable instrument. Students are also asked about their mathematics marks and gender. Mathematics marks consists of 5 groups from 1 to 5.

2.2. Data Analysis

In this study descriptive and inferential statistics were used. Data collected from the 125 students and analyzed in SPSS 20.0 package program. Data were collected in the students' regular classrooms by their mathematics teacher. In descriptive part mean, standard deviation, minimum and maximum values of students' scores on MAS were computed. Descriptive statistics showed students attitudes towards mathematics. In inferential statistics firstly, independent sample t test was used in order to determine whether there is a gender difference in students' attitudes which address second research question. In inferential statistics, ANOVA was made in order to investigate whether there is difference between attitude and achievement or not in order to answer last research question.

3. Results

In this part the findings of the study will be introduced. Findings will be given for each research question separately. There are 67 female and 58 male in the sample. The descriptive statistics about students' achievement scores are given on the table 1.

Table 1. Frequency table of achievement scores.

Grades	Frequency	Percent
1	8	6,4
2	12	9,6
3	31	24,8
4	39	31,2
5	33	26,4
Missing	2	1,6
Total	125	100

It can be inferred from the table that more than % 50 percent of the students have mathematics grade higher than

3. 2 of the students don't give information about their grades. It can be said that in general students' grades are reasonably high. When the frequencies are investigated the data set is not suitable for the variance analysis. In order to make ANOVA in each group there should be at least 30 people (Pallant, 2005). Therefore the groups are formed again. The grades 1, 2 and 3 are joined and named as low, grade 4 named as medium and grade 5 named as high achievement and analysis made with respect to them. The new distribution of students on the groups is given the table 2 below.

Table 2. Revised Frequencies

Grades	Frequency	Percent
Low	51	40,8
Medium	39	31,2
High	33	26,4
Missing	2	1,6
Total	125	100

3.1. Students' attitudes towards mathematics

Descriptive statistics about students' attitudes toward mathematics is given in this part. According to the results of the analysis the minimum attitude score is 24 and maximum score is 100. The mean of the students attitude score is 71.30 and the standard deviation is 17.87. As the maximum score that can be taken from the scale is 100, the mean 71.30 is reasonable high score. It can be said that in general students have positive attitude towards mathematics.

When the frequencies for each item are examined, there are also some interesting results. Although students have higher attitudes in the 13th, 14th and 20th items students indicated negative attitudes. In 13th item which is 'I will never get bored if I studied mathematics for years' only 30 % of the students agreed with the item. In the 14th item which is 'I like studying mathematics more than other subjects' only 37 % of the students agreed with the item and in 20th item which is 'I would like to use most of the study times for mathematics' 40% of the students agreed with the item

3.2. Gender difference on students' attitude scores

Second research question address gender differences in students attitude. The hypothesis tested for this research question is that there is a significant difference between students' attitude scores with respect to their gender. In order to test this hypothesis the independent sample t test was made. Firstly, In order to make independent t test analysis the assumptions of the test should be met. Therefore, before interpreting results the assumption of equality of variances was checked. It is assumed that the variances of groups are homogeny in the population (Pallant, 2007). This assumption is checked by Levene test for equality of variances. Levene test check the null hypothesis that the population variances are equal. In order to meet the assumption it is needed to accept the null hypothesis which means that the significance value of the test should be higher than $\alpha=0.05$. The results of the analysis indicated that data set is appropriate for the analysis (F=0.49, P=0.48). Hence the t test was conducted and the results are given in the table 3 below.

Table 3. Independent Sample t test results

	Df	t	P	Mean difference
Attitude score (F-M)	123	1,233	,220	3,945

The results indicated that there is no statistically significant difference between males (*M=69.16, S=17.32*) and females (*M=73.13, S=18.42*) on their attitude scores, t (124) = 1.23, p< 0.05. There is no gender difference in students' attitude scores for this group.

3.3. Attitude towards mathematics and mathematics achievement

The hypothesis tested for this research question is that there is a significant difference between students' attitude scores with respect to their mathematics achievement. In order to test this hypothesis students' attitude scores are compared with respect to low, medium and high achievement groups. The result of the ANOVA is given below in table 4.

Table 4. ANOVA table

Attitude	Df	f	η	p
Between groups	2	8,929	,130	,000
Within groups	120		,949	
Total	122		,130	

From the table it can be interpreted than there is a significant difference between groups attitude scores F (2,120) = 8.93, p < 0.05. In order to investigate which groups are different, Post Hoc analysis was made.

The results of the multiple comparisons were given on the table 5. The results indicated that there is a significant difference between high achievers (*M = 82.15, S = 13.49*) and low achievers (*M = 67.69, S =16.44*) attitude scores, p< 0.05. There is also a significant difference between high *(M = 82.15, S = 13.49)* and medium (*M = 67.74, S = 20.08*) achievers, p< 0.05. The difference between low (*M = 67.69, S =16.44*) and medium (*M = 67.74, S = 20.08*) achievers is not statistically significant, p > 0.05. Hence the high achievers scored statistically significant high scored on attitude scale with respect to the rest of the group.

Table 5. Multiple comparisons

(I) Achievement	(J) Achievement	(I-J) Mean difference	p
Low	Medium	-,057	,987
	High	-14,465*	,000
Medium	Low	,057	,987
	High	-14,408	,000
High	Low	14,465*	,000
	Medium	14,408*	,000

4. Discussion and Conclusion

Attitude is an important construct that affect mathematics achievement. In this study it is investigated that students' attitudes towards mathematic, the relationship between attitude and achievement and attitude and gender. The results indicated that the students' score on both attitude and achievement is reasonably high. This is an expected result that in general high achievement indicates positive attitude. When students' attitude scores are examined, the overall mean score is relatively high. However is the 3 items more than 60 % of the students disagreed. One of these items the item related to the future studying of mathematics which is that 'I will never get bored if I studied mathematics for years'. The reason behind the low score on this item may be students' perception about the mathematics. In general students could not relate the mathematics and real world situations. Therefore they may have a wrong image about working with mathematics in the future. The other two items are related to the comparison of mathematics and other courses. The items are: 'I like studying mathematics more than other subjects' and 'I would like to use most of the study times for mathematics'. The results indicated that when students compared mathematics with other courses, studying mathematics seems less desirable for them. When these results compared with students attitude scores there seem to be a contradiction. However there are different sources of attitudes. Students' positive attitude towards mathematics may be resulted from liking their teacher not because of the nature of the mathematics.

It is hypothesized in the beginning that there is a gender difference between students' attitude scores. This

prediction is made based on the general findings in the literature. According to Haladayna (1982) 'while boys were found to like science more than girls like science, thus difference is consistently small and variable from study to study and grade to grade'. Oliver indicates a similar result that 'males had significantly more positive attitudes than females' (as cited in Crawley et al, 1994). Aiken (1970) indicated that mathematics seem as male domain therefore male students attitudes are higher than females. On the other hand in recent studies the gender difference seems to be getting smaller. In their meta-analysis Fennema, Hyde, Ryne (1990) indicated that although in some studies there is a difference between gender and attitude, the effect sizes are very small. In this study the difference between males and females' scores on attitude scale is not significant.

In the last research question it is tested the hypothesis that there is a significant difference between students' attitude scores with respect to their mathematics achievement. The results of the study indicated that high mathematics achievers have significantly higher attitude scores. However there is no significant difference is found between low and medium achievers. In the course of achievement and attitude there are also different findings in the literature. Although it is assumed that there is a strong relationship between attitude and achievement, there are many studies indicated very low relationship between attitude and achievement (Abrego, 1966; Deighan, 1971; Vachon, 1984; Wolf & Blixt, 1981 as cited in Ma and Kishor, 1997). On the other hand, in his meta-analysis Wilson (2006) indicated a moderate relationship between achievement and attitude whose magnitude vary between grade levels. Ma and Xu (2004) also investigated causal ordering between attitude and achievement and they found that achievement demonstrate predominance over attitude. This supports the results of the study that high achievement indicates high attitude. Moreover, the reason behind no difference between low and medium achievers may be the process of classification. The classification on achievement was made with respect to grades of students. Hence the grades may not produce a clear distinction between low and medium achievers.

In this study convenience sampling method was used. Therefore sampling procedure is a limitation because there is no randomization. However Ma and Kishor (1997) indicated that although studies which are using random sampling indicate more relationship, non-random studies also gives statistically reliable results. Another limitation is about the content of the achievement. The marks on the school reports were used as indicator of the achievement in this study. However, how much these marks indicate students' achievement may be questionable. Last, study is limited by the data gathered by instrument.

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