
**THE EFFECTS OF PRIMARY SCHOOL TEACHERS' ATTITUDES
TOWARDS THE MATHEMATICS ACHIEVEMENT FORTH
GRADE STUDENTS BY GENDER***

**ÖĞRETMENLERİN MATEMATİĞE KARŞI TUTUMLARININ,
CİNSİYETE GÖRE İLKÖĞRETİM 4. SINIF ÖĞRENCİLERİNİN
MATEMATİK BAŞARILARINA ETKİSİ**

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ABSTRACT

The purpose of this study was to investigate the effect of classroom teachers with weak and strong attitudes towards mathematics on fourth grade students' mathematics achievements in terms of gender. Study was carried out on 337 fourth grade students' (160 girls and 177 boys) who have classroom teachers with strong positive attitudes towards mathematics and 355 students (177 girls and 175 boys) who have teachers with weak positive attitudes. Results revealed that students who have teachers with strong positive attitudes towards mathematics were more successful than the students who have teachers with weak attitudes. There was also a significant interaction between teacher's attitudes and gender. Female students were more successful when their teachers had strong positive attitude towards mathematics. There were no significant differences between genders.

Key-words: Elementary education, mathematics attitudes, student achievement, gender differences, teacher attitudes.

ÖZET

Bu çalışmanın amacı, sınıf öğretmenlerinin matematiğe karşı olan tutumlarının, cinsiyete göre, ilköğretim 4. sınıf öğrencilerinin matematik başarıları üzerine olan etkisinin araştırılmasıdır. Matematiğe karşı pozitif tutumu olan öğretmenlerin, 337 öğrencisi (160 kız, 177 erkek) ve negatif tutumu olan öğretmenlerin, 355 öğrencisi (177 kız, 175 erkek) üzerinde yapılan çalışma sonucunda pozitif tutumu olan öğretmenlerin öğrencilerinin; negatif tutumu olan öğretmenlerin öğrencilerine göre daha başarılı olduğu görülmüştür. Bunun yanında, cinsiyete göre, olumlu tu-

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tumu olan öğretmenlerin kız öğrencilerinin de daha başarılı olmasına karşın cinsiyetler arasında anlamlı bir fark çıkmamıştır.

Anahtar sözcükler: İlköğretim, matematik tutumu, öğrenci başarısı, cinsiyet farklılıkları öğretmen tutumu.

1. INTRODUCTION

Mathematics holds a key position in the curriculum. Virtually, in all countries, it is a core component of the school curriculum. Parents and educators consider Mathematics as a bench of reference for a number of opportunities for occupational and educational advancement. Though math is vital to students' future, many students have difficulty with it.

Students like or dislike mathematics on the basis of their own experiences. Positive experiences could all be related to good grades, awards and teachers' praise in overcoming mathematics difficulty. Likewise, students' worst experience involve failure, criticism, and difficulties which are yet to be overcome (Stuarts, 2000). While teachers play important role in motivating and encouraging students to develop positive attitudes, many classroom teachers who are non-specialist in math, perceive mathematics difficult and threatening because of their worst experiences during their own educational lives. Several researches showed that pre-service elementary teachers have less favorable attitudes toward mathematics than the general university population (Kelly& Tomhave, 1985; Rech et al., 1993).

Jensen (1993) reports the primary intent of teaching math is to aid students in developing the idea that they can be successful at mathematics. The learning of mathematics for students appear to be related to beliefs, feelings, and perceptions. Teachers whose attitude are weak towards mathematics, failed to create a motivating environment, hence, an enthusiasm for student's which is key to the success (Trisha, 1999).

It seems that there is no consensus in the scientific literature about a relation between performance and attitude, while some researches do not find evidence of significant relations between performance in mathematics and attitudes toward this subject (Klubya & Glencross, 1997); others (Kloosterman & Cougan, 1994; Ma, 1997, Trisha, 1999) have confirmed the existence of strong relationships between affective variables and school performance. According to the social psychologists, relationship between behaviors and attitudes depends on the conditions. Attitudes can predict behavior better under conditions where (1) attitudes are shaped by direct experience; (2) attitudes are based on knowledge; and (3) attitudes are attended to

(Deaux, Dane, Wrightsman & Sigelman, 1993). As mentioned above, teachers have developed attitudes toward mathematics through pedagogical knowledge, pedagogical content knowledge and classroom instruction.

In this study we classified teachers according to their attitudes toward math as weak and strong. We assumed that teachers who have strong positive attitudes towards math reflect their feelings about math on their students and they organize more effective teaching environment for them than the teachers with weak attitudes in the classroom. They also maintain students' involvement in instructional activities by initially stimulating the students' interest and effectively holding their attention throughout the lesson. Therefore students of the teachers with strong attitude towards mathematics may be more successful than the students of the teachers with weak attitude.

In this study, we have also considered gender factor. Gender differences in mathematics test performance have been documented extensively (Hyde, Fennema, & Lamon, 1990; Kimball, 1989). The pattern of gender differences is complex, however, it varies with the age of the student and the type of mathematics performance that is assessed and teaching methods that are used by the teachers. In most studies, no significant differences have been found in the performance of boys and girls in elementary school, but girls begin outperforming boys in computation in grades 5-6, at about 10 to 12 years old (Halpern, 1992; Kimball, 1989).

Reviews and meta-analysis suggest that the gender difference favoring girls disappears in early adolescence, and reliable gender differences favoring boys emerge in adolescence and persist through high school and college (Friedman, 1989; Halpern, 1992; Leder, 1992).

Several explanations have been proposed to account for observed gender differences including aspects of mathematics education that create learning environments and teaching methods. Kimball (1989) concluded that female students are more likely than male students to memorize algorithms, formulas, and examples of math procedures that are presented in the classroom. Girls then apply these learned procedures to similar and new problems that are encountered in the course of classroom experiences. Male students, on the other hand, take a more autonomous approach to math learning and prefer to develop their own solutions more often than female students do. Boys also prefer to rely on independent mathematics experiences outside of the classroom rather than routine procedures thought in the classroom. From these results, we concluded that female students need more organized and helpful teaching environment in the classroom than the male students. There-

fore in this study we expected that female students are more influenced than the male by the teacher attitudes.

Given these considerations, in this study, we examined the effect of classroom teachers' attitudes towards mathematics on fourth grade math achievements by gender. With the following hypothesis:

1. Students of the teachers who have strong positive attitude towards mathematics, are more successful in math than the students who have teachers with weak positive attitudes.
2. Teachers who have strong positive attitudes towards math affect girls more positively than the boys in math achievements.

2. METHOD

2.1. Subjects

337 students (160 girls and 177 boys) who have classroom teachers with strong positive attitudes towards mathematics and 355 students (177 girls and 175 boys) who have teachers with weak positive attitudes from fourth grade were the sample of this study. Teachers and their students were selected from 11 public elementary schools in the centre of Istanbul which has similar conditions such as the background of the teachers : years of experience, level of Mathematics education, size of the classrooms and facilities.

2.2. Instruments

In this study mathematics achievement test for fourth grade was used to collect data. This test was constructed for the study by researchers. Test consist of 35 multiple choice questions. Items were taken from fourth grade mathematics curriculum that was accepted by the Ministry of National Education. (In Turkey all of the schools implemented the same curriculum). To maximize validity of the test, test items were selected from each part of the content and they were examined by the classroom teachers and subject specialist before pilot tests. KR-20 reliability of the test was found .83.

Attitude Scale towards mathematics for teachers was developed by Aşkar (1986) The Likert-type scale (1= Strongly disagree, 5= Strongly agree) comprises 20 items, 10 of which are positive feeling statements and 10 of negative feelings, with values that vary from 20 to 100. In the pilot testing on the similar teacher groups, Cronbach- alpha = .92 ; Mean score = 75.21; SD = 17.65 were found.

2.3. Procedure

The research was conducted in two phases: (a) Selection of teachers with weak and strong mathematics attitudes (b) administration of mathematics achievement test.

To determine teachers who have weak and strong positive attitudes toward math, we select 11 public schools that were similar in demographics. Attitude towards mathematics scale was administered to the 63 fourth grade classroom teachers in these schools by the researcher during the off time of the teachers.

When the subjects were ranked according to values, top ten teachers were selected as teacher having strong positive attitudes and bottom ten were selected as teachers with weak attitudes according to scale. Mean value for the strong attitude teachers are computed 95.3, for weak attitude teachers 55.7. The differences between group values were found statistically significant $t = 13.05, p < 0.001$.

At the second phase of the study, the students who participated in this study completed the mathematics achievement test for grade four in a group classroom setting that lasted 40 minute. Tests were administered at the end of the school year.

3. RESULTS

To determine the effects of the teacher attitudes towards mathematics (strong-weak) on students' mathematics achievement scores and gender variables, analysis of variance (ANOVA's) were conducted. Means and standard deviations of the analysis appear in Table 1.

Results of the ANOVA revealed a significant main effect for teacher attitudes towards mathematics. $F = 1, 687, p < 0.01$. In addition, means of the achievement tests showed that students who have teachers with strong positive attitude towards mathematics $M = 22.41$ were more successful than the students who have teachers with weak attitudes $M = 10.31$. There was also a significant interaction between teacher attitudes and gender variables, $F = 1, 687$. Means of the achievement test indicated that female students were more successful when their teachers have strong positive attitude towards mathematics. There was no significant difference between the two genders male and female ($F = 1, 688$), although as it has already been started above, some significant interaction exists between teacher attitudes and gender variables.

Table 1. Means and Standard Deviations for the Groups on Achievement Test to students

Group	Achievement test			
	Gender	M	SD	N
Strong	Male	21.92	6.19	177
	Female	22.96	5.21	160
	Total	22.41	5.76	337
Weak	Male	11.44	3.95	174
	Female	9.20	2.66	178
	Total	10.31	3.54	352
Total	Male	16.72	7.38	351
	Female	15.71	7.99	338
	Total	16.23	7.70	689

4. DISCUSSION

The results of this study confirmed our hypothesis. In hypothesis 1, we suggested that the teachers' attitudes toward mathematics influence achievements of the students. In this study we found that students who have teachers with strong positive attitudes towards mathematics are more successful than the students who have teachers with weak attitudes. Teacher attitudes can influence student achievement in two ways: (1) Teachers who have strong positive attitude toward math may reflect their positive feelings about math in students so that students also develop positive attitude and they can be successful. There is some evidence that attitudes towards mathematics affect students' performance (Trisha, 1999). Swetman, D. L., (1994) found a slight negative correlation between teacher attitudes and student attitudes towards mathematics. Ma,-Xin and Kishor,-Nand (1997), research conducted a meta-analysis to integrate and summarize the findings from 113 primary studies. The statistical results of these studies were transformed into a common effect size measure, correlation coefficient. This relationship was found to be dependent on a number of variables: grade, ethnic background, sample selection, sample size, and date of publication. Gender did not have a significant effect on the relationship, nor were there any significant interactions among gender, grade, and ethnic background. (2) Teacher attitudes towards mathematics may affect the effectiveness of the teaching itself. It can be expected that teachers with strong attitudes organize more effective learning environment for their students. Analysis shows that the teacher has a significant effect on algebra achievement scores, and attitudes significantly affected mathematics scores Leah,P. (2005,134). In this study, we didn't gather data about learning environments which were organ-

ized by the teachers in the classroom. Researchers also must observe teaching behaviors of the teachers who have strong and weak attitudes towards mathematics at the further studies to determine differences between teachers.

In this study, we didn't find significant differences between achievements of the students by genders. This finding supported previous studies in which no significant differences have been found in the performance of boys and girls in elementary school (Linn & Hayde, 1989; Mills, Ablard, & Stumpf, 1993).

Another important finding of this study was that female students were more successful than the male students when they have teachers with strong positive attitude towards mathematics. There are several studies which investigate the effect of the teaching methods on students' gender. For example, Fennema and Peterson (1985) reported that girls excel mathematically in cooperative social environments, whereas boys do well in competitive environments. Similarly, girls have shown greater achievement gains than boys as a result of cooperative small-group work. (Fennema & Peterson, 1987). On the other hand, there is some evidence that girls and boys have different learning styles and that girls prefer to learn mathematics through rules and algorithms. Male students take a more autonomous approach to maths learning (Kimball, 1989).

Finally, a number of other important questions remain that were not addressed by the present study. We need more evidence to interpret our results. First, behavior of teachers who show strong or weak attitudes toward mathematics; second, differences in teaching methods used by different teachers; third, behavior or teaching methods that influence girls more than the boys affect students' achievements or failures. Obviously, more research is needed to obtain answers to these questions.

In conclusion, this study indicated that teacher attitudes towards mathematics is an important factor to students' mathematics achievements. For that reason, to develop positive attitude towards mathematics must be an important objective of the pre-service teacher education curriculum. In addition teachers know more mathematics, and knowing more mathematics lets them better lesson to their students. Ball (1990) contended that mathematics method courses can change pre-service teachers' knowledge, assumptions, and feelings about mathematics, as well as their beliefs concerning their role as teacher in the classroom. Similarly, Quin (1997) and Took et. al., (1989) found that Mathematical Method courses develop teacher attitudes and reduce their maths anxiety. We also need to develop new methods or strategies to develop teachers' attitudes towards mathematics.

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