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Attitudes of elementary school students towards solving mathematics problems

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Abstract

There are many factors that have an effect on learning. As known, learning takes place in cognitive, affective and psychomotor areas. Currently, affective area has been recognized both as a part of education and the focus point of studies. Affective characteristics often play role in learning that takes place in schools. One of these affective characteristics is student attitude towards the course. Unfortunately it is acknowledged that students have been developing negative attitude towards mathematics since the early years of their lives. In this sense, purpose of this study is to analyze the attitudes of elementary school students towards problem solving. Working group of the study covers elementary school students. "Attitude Scale for Mathematics Problem Solving" developed by Canakcı and Ozdemir (2011) was employed as data collection tool to measure the attitudes of students towards problem solving. The scale has two dimensions called "enjoyment" and "teaching". At the end of the study, it was seen that there was a decrease in the level of "enjoyment" dimension as the grade level increased. This decrease became a significant difference for eighth grades.

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Keywords: Mathematics education; problem solving; attitude towards problem solving; elementary school students

1. Introduction

For many people mathematics is one of the courses making life miserable. It only reminds exams which spread fear, and it is a nightmare to awake from as soon as the school finishes. However, mathematics was able to be one of the ways to understand and love the life for some as well. As it is the same with all the other things, loving something requires understanding it. We love nothing but the things we understand. We adopt a negative attitude

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towards the things we do not understand. Since people are not able to understand mathematics thoroughly, they adopt a negative attitude towards it. One of the underlying reasons for not liking mathematics is closely associated with the self-confidence of the individual in relation to his/her problem solving skills. Therefore, problem solving in mathematics course is of vital importance (Yıldızlar, 2001).

Interest and attitude is a single quality with two poles. One of them extends to having positive views regarding a course or a subject, and liking a course or displaying positive affective characteristics in relation to it. The other extends to having negative views regarding a course or a subject and disliking or displaying negative affective characteristics towards it (Bloom, 1979). He conducted studies in seven different countries. He stated that there is a connection between affective characteristics one has towards a course and achievement. Thus, the education must be organized to meet the needs of students in order to make them develop positive attitudes towards learning.

Attitudes are not behaviors. They are the underlying psychological variables guiding one's behaviors. The attitudes have three dimensions. Cognitive dimension is comprised of the beliefs one has in relation to attitude. It involves students views claiming that mathematics is a course which is impossible to learn or the most beneficial one. Emotional dimension is comprised of the affective reactions employed by a person in relation to the attitude. It involves a student's feelings of fear, hate or love and like towards mathematics. Emotional dimension is more dominant in extreme attitudes. Behavioral dimension covers the behaviors in accordance with the attitude. It involves either students' escaping from the course mathematics or not doing assignments or never avoiding a course of mathematics and reading relevant publications in his/her free time.

Previous studies on attitudes indicated that attitudes were adopted in early years of one's life. Also, they stated that those attitudes which have been adopted in early years do not change easily except when one has importance experiences (Kocabas, 1997). Since education is an important way of changing attitudes, teachers should know student attitudes both towards their courses and other phenomenon in social life. They should also know how to measure their attitudes which might be an important factor to increase the quality of education. Therefore, studies to measure student attitudes towards certain subjects of a course are of considerable importance recently.

Problem solving, which marked the century we are living in, is among the objectives all courses. It is to be acknowledged that teaching method of 21st century is problem solving. Hence, problem and structure of problem solving as well as increasing achievement in problem solving are issues dealt by many educators and psychologists (Kılıc and Samancı, 2005).

Problem

- What kinds of attitudes do elementary students have towards problem solving?

Sub-Problems

- Do attitude scores of elementary school students towards problem solving differ from each other based on gender?
- Do attitude scores of elementary school students towards problem solving differ from each other based on their grades?
- Do attitude scores of elementary school students towards problem solving differ from each other based on variable 'liking mathematics'?
- Is there a significant relation between attitude scores of elementary school students towards problem solving and the scores they got from scale's sub-dimensions?

2. Method

2.1. Research design

The study has descriptive survey model. Descriptive survey model aims at revealing a state as it is whether it belongs to past or present (Karasar, 2004).

2.2. Working group

Working group of the study consists of 225 students in total. The study was carried out during 2013-2014

academic year in Istanbul. 106 of the students were female while the rest 119 were male. 30 students from 5th grades (50,0%) were female and the rest 30 (50,0%) were male. 23 students from 6th grades (38,3%) were female while 37 students (61,7%) were male. 32 students from 7th grades (53,3%) were female while 28 students (46,7%) were male. 21 students from 8th grades (46,7%) were female while 24 students (53,3%) were male.

2.3. Data collection tools, collecting data and data analysis

The study employed 'Attitude Scale for Mathematics Problem Solving' developed by Çanakçı and Özdemir (2011) in order to reveal student attitudes towards problem solving. Attitude Scale for Mathematics Problem Solving is 5 point Likert type scale and consists of 19 items. This scale covers two sub-dimensions which are 'Enjoyment' and 'Teaching'. Reliability coefficient of the scale is .84 while the reliability coefficient was calculated .83 for this study. Considering the purpose of the study, data collected for sub-problems were statistically analysed using SPSS 18.0. To analyse data, Unrelated Group, t Test and One-Way Variance Analysis (ANOVA) were employed depending on the variables. The analysis of the relation between dependent variables was calculated using Pearson Moments Multiplication Correlation Coefficient method.

3. Findings

This section covers the findings obtained at the end of the study.

Table 1. Independent t test results to reveal whether student scores of 'attitude scale for mathematics problem solving' differ based on gender variable

	Gender	N	$\overline{x}$	S	sd	t	p
The Dimension of Enjoyment	Female	106	33,80	10,79	262	-1,078	,282
	Male	119	32,18	11,60			
The Dimension of Teaching	Female	106	38,89	4,89	262	-2,956	*,003*
	Male	119	36,61	6,46			
Scale Total	Female	106	72,69	13,20	262	-2,055	*,041*
	Male	119	68,79	15,04			

As it is clear from the Table 1, Unrelated Group t-Test was conducted in order to reveal the significant difference between working group 'Attitude Scale for Problem Solving' sub-dimensions and total scale scores based on 'Gender'. At the end of the analysis, there was significant difference on behalf of female students (t=-2,055, p<.05) between Attitude Scale for Mathematics Problem Solving scores (t= -2,956, p<.05) and total scale scores (t=-2,055, p<.05). However, there was no significant difference between Attitude Scale for Mathematics Problem Solving The Dimension of Enjoyment scores (t= -1,078, p>.05) based on gender.

Table 2. One-way variance analysis (anova) results to reveal whether attitude scale for mathematics problem solving based on grade variable

Score	Group	N	$\overline{x}$	ss	Var.	Means	Sd	Sq	F	p
The Dimension of Enjoyment	5th Grades	60	35,90	10,28	B. Groups	3083,816	3	1027,939	9,019	*,000*
	6th Grades	60	35,51	9,17	W. Group	25187,544	221	113,971		
	7th Grades	60	32,61	11,41	Total	28271,360	224			
	8th Grades	45	26,02	11,96						
	Total	225	32,94	11,23						
The Dimension of Teaching	5th Grades	60	38,43	5,55	B. Groups	231,044	3	77,015		
	6th Grades	60	36,96	6,29	W. Group	7519,178	221	34,023		

	7th Grades	60	38,76	5,29	Total	7750,222	224		2,264	,082
	8th Grades	45	36,22	6,22						
	Total	225	37,68	5,88						
Total Scores	5th Grades	60	74,33	12,85	B. Groups	4227,304	3	1409,101	7,475	*,000*
	6th Grades	60	72,48	13,29	W. Group	41658,811	221	188,501		
	7th Grades	60	71,38	14,44	Total	45886,116	224			
	8th Grades	45	62,24	14,43						
	Total	225	70,63	14,31						

Addressing the findings, there is a positive difference on behalf of female students between 5th, 6th, 7th and 8th grade students in terms of the dimension of teaching of problem solving attitude. This finding can be interpreted by stating that female students are more positive towards learning than male students.

One-Way Variance Analysis (ANOVA) result to reveal whether arithmetic average of Attitude Scale for Mathematics Problem Solving based on grade variable indicated statistically significant difference in terms of the Dimension of Enjoyment [$F_{(3-221)=}$ 9,019, p<.01] and Total Scale [$F_{(3-221)=}$ 7,475, p<.01]. Afterwards, post-hoc Scheffe test was conducted to determine the groups between which there is a significant difference according to ANOVA.

Accordingly; It was decided that score average of enjoyment mathematics and total score average for 5th, 6th, and 7th grade students were statistically higher than those of 8th grade students. There was no statistically significant difference between groups in terms of Attitude Scale for Mathematics Problem Solving The Dimension of Teaching.

Table 3. One-way variance analysis (ANOVA) results to reveal whether attitude scale for mathematics problem solving scores based on 'do you like mathematics?'

Score	Group	N	$\overline{x}$	ss	Var.	Means	Sd	Sq	F	p
The Dimension of Enjoyment	I like mathematics	130	39,72	7,82	B. Groups	15017,198	2	7508,599	125,765	*,000*
	I am hesitant	63	25,84	7,97	W. Group	13254,162	222	59,703		
	I do not like Mathematics	32	19,40	6,74	Total	28271,360	224			
	Total	225	32,94	11,23						
The Dimension of Teaching	I like mathematics	130	39,44	4,94	B. Groups	1276,145	2	638,072	21,880	*,000*
	I am hesitant	63	36,60	4,87	W. Group	6474,077	222	29,163		
	I do not like Mathematics	32	32,68	7,72	Total	7750,222	224			
	Total	225	37,68	5,88						

Table 3. One-way variance analysis (ANOVA) results to reveal whether attitude scale for mathematics problem solving scores based on 'do you like mathematics?'(Continue)

Total Score	I like mathematics	130	79,16	10,19	B. Groups	24695,564	2	12347,782	129,360	*,000*
	I am hesitant	63	62,44	9,33	W. Group	21190,551	222	95,453		
	I do not like Mathematics	32	52,09	8,77	Total	45886,116	224			
	Total	225	70,63	14,31						

Considering the One-Way Variance Analysis (ANOVA) result to reveal whether arithmetic average of Attitude Scale for Mathematics Problem Solving based on answers given to question 'Do you like Mathematics?', the difference between arithmetic averages of answers given to this question was statistically difference from The

Dimension of Enjoyment [$F_{(2-222)=}$ 125,765, p<.01], The Dimension of Teaching [$F_{(2-222)=}$ 21,880, p<.01] and Total Scale [$F_{(2-222)=}$ 129,360, p<.01]. Afterwards, post-hoc Scheffe test was conducted to determine the groups between which there is a significant difference according to ANOVA. Accordingly, it was decided that those who gave the answer 'I like Mathematics' had statistically significant and higher scores of liking mathematics course and total scale scores than those who gave the answers 'I am hesitant' and 'I do not like mathematics course'

As for The Dimension of Teaching of Attitude Scale for Mathematics Problem Solving, dimension of teaching scores of those who gave the answer 'I like mathematics course' were statistically higher than those who gave the answers 'I am hesitant' and 'I do not like mathematics course'. Also, again in terms of teaching, averages of those who gave the answer 'I am hesitant' were statistically significant and higher than those who have the answer 'I do not like mathematics course'.

Table 4. Pearson multiplication moment correlation analysis results to reveal the relation between students' total score of 'attitude scale for mathematics problem solving' and scale dimensions

Variables	N	r	p
Total Scale Score The Dimension of Enjoyment	225	,922	,000
Total Scale Score The Dimension of Teaching	225	,673	,000

Considering Table 4, there is a positive significant relationship between sample group students' total scores of 'Attitude Scale for Problem Solving' and total scores for Enjoyment (r=,922; p<.01) and Teaching (r=,673; p<.01).

4. Conclusion

Addressing the findings, there is a positive difference on behalf of female students between 5th, 6th, 7th and 8th grade students in terms of the dimension of teaching of problem solving attitude. This finding can be interpreted by stating that female students are more positive towards learning than male students.

Considering grades, it was seen that attitude scores were decreasing from 5th grade to 8th grade. A statistically significant difference was detected due to the decrease in the scores of 8th grades. Dealing with this result by taking into account the studies claiming that there is a positive change in terms of problem solving processes as the grade raises (Akkan, Baki & Cakıroglu, 2012; Artut & Tarım, 2006), it is rather puzzling that the attitude towards problem solving decreases though problem solving skills and achievements are increasing problem. Particularly low attitude levels of eighth grade students may stem from the exams they have to take within the scope of Turkish Educational System.

There was a statistically significant difference since the average of liking mathematics was higher than disliking. This indicated that the average of attitude towards problem solving was low due to the burden of exam despite the fact that they liked mathematics. Arslan (2002) mentioned the positive effect of non-routine mathematical problems towards mathematics. In this sense, it is possible to recommend non-routine problems and problems derived from daily life to be employed in the lectures in order to raise the level of attitudes towards problem solving. In addition, Marchiş (2013) stated that to develop a positive attitude towards Mathematics it is important to use teaching methods, which encourage collaboration, put the student in the situation of explaining his/her solution, and require creativity from students. Marchiş's suggestions can be taken into account for attitudes towards problem solving.

References

Akkan,Y., Baki,A. & Cakıroglu, U. (2012). Examination of 5th -8th Grade Students' Transition Process From Arithmetic to Algebra with Regard Problem Solving, *Hacettepe University Journal of Education*, 43, 1-13.

Arslan, C. (2002). İlköğretim Yedinci ve Sekizinci Sınıf Öğrencilerinin Problem Çözme Stratejilerini Kullanabilme Düzeyleri Üzerine Bir Çalışma, Yayınlanmamış Yükseklisans tezi.

Artut,P.D. & Tarım, K. (2006) Investigation of the Elementary School Students' Problem Solving Levels, Problem Solving Strategies and Error Types in the non-routine word problems , *Çukurova Üniversitesi. Sosyal Bilimler Enstitüsü Dergisi*, 15(2).39-50

Bloom, B.S. (1979), İnsan Nitelikleri ve Okulda Öğrenme. (Çev. Durmuş Ali Özçelik), Milli Eğitim Basımevi, Ankara

Çanakçı, O. & Özdemir, A. Ş. (2011). The Construction of Mathematics Problem Solving Attitude Scale, Abant İzzet Baysal University Education Faculty Journal, 11(1), 119-136.

Karasar, N. (2004). Bilimsel Araştırma Yöntemi [Scientific Research Method], 13. Baskı, Ankara: Nobel Yayın Dağıtım.

Kılıç, D. & Samancı, O. (2005). The Usage of Problem Solving Method in Social Knowledge Lesson Given in Primary School, Kazım Karabekir Education faculty Journal, 11, 100–112.

Kocabaş, A. (1997), Temel Eğitim 2. Kademe Öğrencileri İçin Müziğe İlişkin Tutum Ölçeğinin Geçerlik ve Güvenirlik Çalışması, Hacettepe University Education Faculty, (13), 141-145.

Marchiş, I. (2013). Relation Between Students' Attitude Towards Mathematics And Their Problem Solving Skills, Pedecta, 3(2).

Yıldızlar, M. (2001). Matematik problemlerini çözebilme yöntemleri. Ankara: Eylül Kitap ve Yayınevi,