

# Elementary School Students Perception Levels of Problem Solving Skills

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**Abstract** The purpose of this study is to reveal the perception levels of problem solving skills of elementary school students. The sample of the study is formed by totally 264 elementary students attending to 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> grade in a big city in Turkey. Data were collected by means of 'Perception Scale for Problem Solving Skills' which consists of two sub-dimensions. As a result of the study, the perception level of problem solving skills of elementary school students was high and there was no difference according to their genders. Perception levels of problem solving skills of students show a significant difference according to their grade levels. This difference is due to the fact that 8<sup>th</sup> grade levels are lower scores than other grades. At the same time, there is a similar and significant relationship between students' perception scores for problem-solving skills and the sub-dimension 'Perceived willingness and commitment towards problem solving skills' scores.

**Keywords** Problem Solving Skills Perception, Mathematics Attitude, Elementary School Students

## 1. Introduction

Parallel to rapid technological and scientific developments in the world, the problems faced by people are multiplying and becoming complicated. It is necessary to seek and develop appropriate solutions to these problems. Problem solving is a tool for new ideas and abilities [1] a way to develop effective learning and individual skills [2]. Problem solving is one of the focus areas of 21st century learning [3]. It involves the composition and coordination of various abilities, beliefs, attitudes, perceptions, knowledge and prior achievements. For this reason, it has an important place in teaching mathematics. There are different problem-solving approaches depending on the problem solving, the characteristics of the activities, the nature of the problem and the person who is interested with the problem.

The more traditional, rational approach is typically used and involves, e.g., clarifying description of the problem, analyzing causes, identifying alternatives, assessing each alternative, choosing one, implementing it, and evaluating whether the problem was solved or not [4].

Problem-solving skill is seen as an individual variable, and it is expressed that the individual is shaped based on his beliefs and anticipations about his problem-solving skills [5] and helps the individual to effectively adapt to the environment in which he/she live [6]. In addition to the social problems that individuals have to solve in their society, the problems most often encountered by students are related to mathematics lessons [7] and science lessons, particularly physics and chemistry [8]. Mathematics-related behaviors which are related to problem-solving skills perceptions, contained in programs ranging from pre-school education to higher education [9].

When the literature is examined, there are researches on problem solving perception in different education levels with different variables. Koç [10] analyzed perceptions of second-level elementary school students about problem solving skills and their help seeking during the learning process. She found a significant relationship between primary school students' perceptions of problem solving skills and their need for help. Sezen and Palic [11] carried out a study with the aim of revealing the levels of problem solving skills of high school students. As a result of the study, it was determined that female students perceive themselves more positively in terms of problem solving skill than male students. However, it was found that grade levels did not have a significant effect on students' perception of problem solving skills.

Problem solving skills perception usually associated with the affective area. In this study, the relationship between problem solving skill perception and mathematical success and interest towards mathematics was tried to be revealed.

The aim of this study was two-fold. The first aim was to determine the levels of perception of problem solving skills of elementary school students. The second aim was to compare the effects of perception of problem solving skills,

mathematical success and interest towards mathematics. The present study focused on the following research questions within this general purpose:

What are the perception levels of problem solving skills of elementary school students?

Is there a significant difference between elementary school students' perception levels of problem solving skills according to gender?

Is there a significant difference between problem-solving perception scores and interest towards mathematics?

Is there a significant difference between elementary school students' perception levels of problem solving skills according to grade levels?

Is there a significant difference between elementary school students' perception levels of problem solving skills according to mathematics success?

## 2. Materials and Methods

### 2.1. Participants

Sample of the study is formed by randomly selected 264 elementary students (139 female, 125 male) from a school in İstanbul-Turkey. Thirty-six of the 5th year students (50.0%) were female, 36 (50.0%) were male; 28 of the 6th grade students (38.4%) were female, 45 (61.6%) were male; 40 of the 7th grade students (55.6%) were female, 32 (44.4%) were male; 21 of the 8th grade students (44.4%) were girls and 26 (55.3%) were males.

### 2.2. Data Collection Tools and Data Analysis

As a means of collecting data in the study, "Perception Scale for Problem Solving Skills" developed by Ekici and Balım [12] was used to determine students' perceptions of problem solving skills. For this scale, a form consisting of 37 items was applied to 850 elementary school students. As a result of preliminary applications of the scale, 6 items which were included as scale control items were removed from the analysis. As a result of the factor analysis, 9 items were removed from the scale and analyzes were repeated. Confirmatory and descriptive factor analysis of the "Perceptions Scale for Problem Solving Skills" revealed that the scale had two factors and 22 items including 15 positive and 7 negative items prepared in 5-point Likert style. The variance values regarding the factors were determined to be 30.239% for the first factor and 9.976% for the second factor. The scale consists of two sub-dimensions, "Perception towards problem solving skills" (15 items) and "Perceived willingness and commitment towards problem solving skills" (7 items). The reliability coefficient of the scale was .88 and the reliability coefficient was .86 in this study. The statistics of the collected data for the sub-problems were made using SPSS 18.0.

The results of the Kolmogorov-Smirnov normality test were examined to determine whether the data were fit for normal distribution before switching to the analysis process. The results of the Kolmogorov-Smirnov normality test were found to be normal for all dependent groups and parametric tests were used in this context. In the analysis of the data; unrelated group t test and one way analysis of variance (ANOVA) were used depending on the variables. The analysis of the relationship between dependent variables was calculated by applying the Pearson Moments Multiplication Correlation Coefficient technique.

## 3. Findings and Comments

This section contains findings from the research. Table 1 shows the descriptive statistics of the perception levels of problem solving skills of elementary school students.

**Table 1.** Perception levels of problem solving skills

	N	Mean	S
1.Sub-dimension	264	60.53	8.99
2.Sub-dimension	264	25.22	6.28
Total Scale	264	85.00	12.5

Standard deviation and average was used to determine the perception levels of students problem solving skills. The average of the scale score was obtained with the division of "the difference between highest value and the lowest value into two" and addition of this value to lowest value ( $110-22=88$ ,  $88/2=44$ ,  $22+44=66$ ). Standard deviation is added and subtracted to the average for the calculation of the intervals ( $66+12.5=78.5$ ,  $66-12.5=53.5$ ). Thus, middle level is obtained. The difference between the standard deviation and the average is regarded as the low level ( $66-12.5= 53.5$ ). The value that is the sum of the standard deviation and the average is regarded as the upper level ( $66+12.5= 78.5$ ). So as a result these are used in order to decide the limits of levels; the average score of the scale is 66, ranging from 22 to 53.5 indicates the students with low levels, 53.5 to 78.5 indicates the students with medium levels and 78.5 to 110 indicates the high levels of perception of problem solving skills. The overall average score of the study group was 85, indicating that the level of problem-solving perception of elementary school students was high.

Table 2 shows Independent Group t Test results which were made to determine whether the students' perceptions of problem solving scores differ according to gender variable.

As a result of analysis; there was no significant difference between the gender of the sample and the first sub-dimension "Perception towards problem solving skills" ( $t=-.688$ ,  $p>.05$ ), second sub-dimension "Perceived willingness and commitment towards problem solving skills" ( $t=-1.110$ ,  $p>.05$ ) and scale total scores ( $t=-1.009$ ,  $p>.05$ ).

Independent Group t Test was conducted to determine if the students “Perception of Problem Solving Skills” scores differ according to the answers of the question “Do you like the mathematics lesson?”. Table 3 shows the data analysis results in response to this question.

As a result of analysis; there is a statistically significant difference between first sub-dimension “Perception towards problem solving skills” ( $t=5.699$ ,  $p<.01$ ), second

sub-dimension “Perceived willingness and commitment towards problem solving skills” ( $t=-5.882$ ,  $p < .01$ ) and scale total scores ( $t = 6.925$ ,  $p<.01$ ). The scores of students who likes mathematics and scale sum were found higher than those who did not like this course.

One way ANOVA was performed to determine whether the Perception of Problem Solving Skills scores was differ according to the grade levels.

**Table 2.** Perceptions of problem solving according to gender

	Gender	N	Mean	Std. Deviation	t	p
1. Sub- dimension	Female	139	60.93	8.41	-.688	.492
	Male	125	60.17	9.49		
2.Sub-dimension	Female	139	25.68	6.05	-1.110	.268
	Male	125	24.82	6.48		
Total scale	Female	139	86.61	13.27	-1.009	.314
	Male	125	84.99	12.80		

**Table 3.** Perceptions of problem solving according to liking mathematics

	Likes Mathematics	N	Mean	Std. Deviation	t	p
1. Sub-dimension	Yes	169	62.76	7.86	5.699	.000
	No	95	56.55	9.53		
2.Sub-dimension	Yes	169	26.83	5.89	5.882	.000
	No	95	22.36	5.96		
Total scale	Yes	169	89.60	11.42	6.925	.000
	No	95	78.92	13.03		

**Table 4.** One-way ANOVA results of sub dimensions

	Grade	N	Mean	Std. Deviation		Sum of squares	df	Mean square	F	p
1. Sub-dimension	5	72	63.04	8.45	Between groups	1056.616	3	352.205	4.530	.004
	6	73	59.34	9.01	Within groups	20215.077	260	77.750		
	7	72	61.27	8.31	Total	21271.693	263			
	8	47	57.40	9.75						
	Total	264	60.53	8.99						
2.Sub-dimension	5	72	25.63	6.25	Between groups	394.382	3	131.461	3.417	.018
	6	73	25.53	5.80	Within groups	10003.981	260	38.477		
	7	72	26.18	6.35	Total	10398.364	263			
	8	47	22.65	6.7						
	Total	264	25,22	6.28						
Scale Total	5	72	88.68	12.86	Between groups	2403.739	3	801.246	4.912	.002
	6	73	84.87	12.28	Within groups	42412.227	260	163.124		
	7	72	87.45	12.71	Total	44815.966	263			
	8	47	80.06	13.45						
	Total	264	85.76	13.05						

The difference between arithmetic mean according to grade levels as a result of one way variance analysis (ANOVA) was found to be statistically significant in “Perceived Dimension of Problem Solving Skills” [ $F_{(3-260)}=4.530, p<.05$ ], Perceived Willingness and Commitment Towards Problem Solving Skills” [ $F_{(3-260)}=3.417, p<.05$ ] and scale total [ $F_{(3-260)}=4.912, p<.05$ ]. Post-hoc Scheffe test was used to determine which groups were significant differences after ANOVA. According to this; perceptions of 5<sup>th</sup> grade students towards Problem Solving Skills Scale averages were found to be higher than average scores of 8<sup>th</sup> grade students.

The average score of 7<sup>th</sup> grade students' perceived willingness and commitment towards problem solving skills is higher than the average score of 8<sup>th</sup> grade students. 5<sup>th</sup> and 7<sup>th</sup> grades the total scale scores are higher than the 8<sup>th</sup> grades.

Table 5 shows the results of Pearson Multiplication Moment correlation analysis for the relationship between student's Perception of Problem Solving Skills and mathematics success of students.

As can be seen from Table 5, there was a significant positive correlation between the perceptions of problem solving skills ( $r=.290; p<.01$ ) the perceived willingness and commitment towards problem solving skills ( $r=.335; p<.01$ ) and total scale ( $r=.361; p<.01$ ).

**Table 5.** Results of Pearson correlations

	N	r	p
Mathematics success Perception towards problem solving skills	264	.290	.000
Mathematics success Perceived willingness and commitment towards problem solving skills	264	.335	.000
Mathematics success Scale total	264	.361	.000

#### 4. Discussion and Conclusions

The students in the study group were found to have a high level of perception of problem solving skills. This result may suggest that the sample is successful in the problem-solving process. While Koç [10] found that elementary school students' problem-solving skills perceptions were satisfactory in her study consistent with the results of our study the problem solving scores of the research groups were higher than the average in the various studies related to problem solving [13,14,15,16]. In contrast to this research, many research findings show that problem solving skills and knowledge of elementary school students are not at the desired level [17, 18, 19, 20, 21, 22, 23, 24, 25].

It was concluded that the students' level of perception of problem solving does not differ according to their gender. Although Koç's [10] study showed differences in perception sub-dimensions of problem solving skills of students according to gender, there was no significant difference

between general problem solving skill perceptions. The findings of many researches on problem solving support this result [26, 27, 28, 29, 30].

There is a significant difference between “Perceptions towards Problem Solving Skills”, “Perceived willingness and commitment towards problem solving skills” dimensions and scale total scores according to their answers of the question “Do you like mathematics?”. The scores of students who like mathematics and high scale sum were found to be higher than those who did not like this course. The fact that you like a lesson affects all the process; it can be said that students who likes mathematics are also successful in problem solving. In the survey conducted by Kumandaş and Kutlu [31] the level of mathematics liking is a predictor of the success of the course, and as the level of mathematics liking of the learners' increases, the degree to which they are successful is also one of the result.

The level of perception of problem solving skill by students varies according to their grade levels. 8<sup>th</sup> grade students' problem-solving perception scores are significantly lower than other classes. In Koç's [10] study with 6<sup>th</sup>, 7<sup>th</sup>, and 8<sup>th</sup> grade students, 6<sup>th</sup> grade students' perception level on problem solving skills was found higher than 7<sup>th</sup> and 8<sup>th</sup> grade students. Similarly, the achievements of İflazoğlu Saban and Güzel Yüce [14] are consistent with the results that the averages of 6<sup>th</sup> grade students are significantly higher than the average of 7<sup>th</sup> and 8<sup>th</sup> grade students in the confidence sub-dimension of problem solving skills. In our study, it was found that the highest average belongs to the 5<sup>th</sup> grades when the average of the perception scores among the classes is taken into consideration. This result can be considered to be due to the general concern created by the high school transition examination they have to enter in the 8<sup>th</sup> grades in our education system. In addition, the intensity of problem solving gains in the elementary school program may also have been influential. At the same time, there is a similar and significant relationship between students' perception scores for problem-solving skills and perceived willingness and commitment towards problem solving skills. Researches [11, 32], which show that problem-solving skills decrease as grade level increases, support the findings of the study.

There was a significant positive correlation between students' mathematics success and perception of problem solving skills, perceived willingness and commitment towards problem solving skills and scale total scores at a high level. This shows that students who are successful in mathematics can also be successful at solving problems at the same time. In Özsoy's [24] study titled “The Relationship Between Problem Solving Skills and Mathematical Success”; there is a positive relationship between comprehension, planning, plan implementation, and control scores in the problem solving skill test of students with a high level of mathematics achievement. There is a positive relationship between mathematics success and problem solving skills. The findings of Mason

[33], Mohd and Mahmood, [30], Kaytancı [34] and Tertemiz [35] also support this finding.

Today, problem solving is no longer just one of many currents that have emerged in mathematics education and are forgotten. On the contrary, besides the arithmetic skills required to succeed in school and later in real life, problem solving is regarded as an integral part of the teaching program taught by most teachers [36]. Based on this importance, the recommendation for research is as follows: The reasons for the students' perception level for problem solving should not be reduced as the class levels increase, and the activities for problem solving skills should be increased. Heppner and Krauskopf [37] assume that self-perceived problem-solving skill serves a central function in the way a person perceives and experiences different aspects of dealing with problematic situations. However, it is expected to be reversed, the increase at the grade level caused decrease at the perception of problem-solving skills in the current study. Noushad [38] in a similar way emphasized that children's perceptions of their academic abilities decline precipitously during school. In order to prevent this situation, qualitative or mixed studies can be arranged to investigate the causes of these increase more deeply. Depending on the results obtained from these studies, empirical studies can be carried out to improve the perception of problem solving skills.

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