

# Problems Faced by Primary School Teachers While Teaching Problem-Solving Skills and Suggestions for Solution\*

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Problems Faced by Primary School Teachers While Teaching Problem-Solving Skills and Suggestions for Solution

Sınıf Öğretmenlerinin Problem Çözme Becerisi Kazandırırken Karşılaştıkları Sorunlar ve Çözüm Önerileri

## Abstract

The aim of this study is to determine problems faced by primary teachers while teaching students' ability to solve problem, identify causes, and suggest solutions to solve these problems. The study has a qualitative design. Study group of this study was consisted of 60 primary school teachers working in elementary schools in Kırşehir city center. Participants were selected with convenient random sampling method. The data of the study was collected through interview form with open-ended questions. In the result of the study, it is determined that the most common problems teachers facing while teaching problem-solving skills are student based. It is figured out that the most important problems are grouped into three groups as "student-based", "program-based" and "teacher-based".

## Özet

Bu araştırmanın amacı, sınıf öğretmenlerinin öğrencilere problem çözme becerisini kazandırırken karşılaştıkları sorunları ve nedenlerini tespit etmek, bu sorunlara yönelik geliştirdikleri çözüm yollarını incelemektir. Nitel olarak yapılandırılan bu araştırmanın katılımcıları Kırşehir il merkezinde görev yapan öğretmenler arasından uygun örneklem yöntemi ile belirlenen 60 sınıf öğretmeninden oluşturulmuştur. Araştırmanın verileri, açık uçlu sorulardan oluşan görüşme formu aracılığıyla elde edilmiştir. Bu araştırmanın sonucunda, sınıf öğretmenlerinin problem çözme becerisi kazandırırken karşılaştıkları sorunlar ve nedenleri "öğrenci kaynaklı", "program kaynaklı" ve "öğretmen kaynaklı" olmak üzere üç grup altında toplanmıştır.

**Key Words:** Elementary School, Mathematics Course, Problem-Solving Skill.

**Anahtar Kelimeler:** İlkokul, Matematik Dersi, Problem Çözme Becerisi

## 1. Introduction

Problem is a complex or undeceive question in general. We use different methods and strategies to solve problems. Thinking starts with a problem and solution of the problem turns into an aim for an individual, and this aim guides the way of thinking of an indi-

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vidual. Accordingly, this thinking emerged with problem forms the process (Özsoy, 2005, p. 180).

Problem solving is a cognitive process and skill that we use in our daily lives. Besides, problem solving teaching should be well-structured and support mathematical thinking of students (Özyıldırım-Gümüş and Umay, 2017, p. 747). During elementary school, students learn addition, subtraction, division, and multiplication operations in the mathematics courses with the efforts of their primary school teachers. Students who have four operation skills start with simple structured problems and teachers try to provide students with problem-solving skills.

Starting from 2012-2013 academic year, 4+4+4 education system has been implemented in Turkey. This system extends mandatory schooling from 8 years to 12 years. Ministry of National Education, including the latest form of problem solving definition in 2015, has the objective: "with problem solving process, students can express their own ideas and reasoning, and see problems and shortcomings in mathematical reasoning of others". In this program, problem solving is "a fundamental skill that reinforces all learning areas and has a relationship with other skills. Problem solving is a meaningful learning process that widens and deepens mathematical information as well as reinforcing mathematical information" (Ministry of National Education [MoNE], 2015, p. 7).

Problem solving has various models. The most common of these model is four-step problem solving model of George Polya. These four-steps are: "understanding the problem", "planning", "executing the plan", and "evaluation". Rather than having a direct knowledge to be learned in these four-steps, this approach is guided with teacher questions. Four-steps of problem-solving process indicate the path to follow for problem solving and aim students to gain scientific thinking methods. During problem solving activities, both mathematical skill developments are supported and reasoning skills is taught (MoNE, 2015, p.6).

"Problem solving skills change from one to another (Mutlu-Aydın, 2013, p. 22). Fear and anxiety towards mathematics and problem-solving activities of students have negative effect on teaching these skills. "One of the most important problems in mathematic field is this anxiety experienced by students" (Baloğlu, 2001, p.3). Problems faced regarding problem solving in mathematic field bring about negative judgement, anxiety, and fear among students. Repetitive problems reinforce the belief of children that they will fail in the course or they are not smart enough. Students with lower fear and anxiety levels can solve problems easier and their self-confidence level increases as they can solve problems.

“Problem solving in mathematics teaching develops high level thinking of students.” This way, it is believed that students with problem solving skills will have increased self-confidence, and experience successful education life in mathematics course and other courses (Tertemiz, 2017, p. 2). While primary teachers try to teach problem solving skills to their students, they are experiencing different problems in each step of problem solving. The aim of this study is to analyze problems faced by primary school teachers while teaching problem solving skills, reasons for these problems, and suggestions related with solution of this problem. Thus, answers for the following questions are investigated.

What are the problems faced by primary teachers while teaching problem-solving skills and suggestions for solutions?

While teaching problem solving skills, what are the attitudes of students towards problem solving skills?

What are the strategies, methods, and techniques adopted by primary teachers while teaching problem solving skills?

What are tools and materials used by primary teachers while teaching problem-solving skills and suggestions for solutions?

What are the suggestions for solutions towards problems faced while teaching problem-solving skills?

## **2.Methodology**

In this study to analyse problems faced by primary teachers while teaching problem-solving skills, reasons, and suggestions related with solution of these problems, descriptive phenomenology pattern among qualitative analysis methods was adopted. “Descriptive phenomenology has epistemological perspective and deals with what individuals know. Critical question of this method is “What is known?” and this method fundamentally tries to find an answer to this question (Reiners, 2012; Cited in Ersoy, 2016, p. 59).

### **2.1. Participants**

Study group of this study was selected with convenient random sampling method among elementary schools in Kırşehir city centre and consisted of 60 primary teachers. Each sample unit were given equal selection chance (to keep constant selection probability for non-selected units, selected unit is placed back to selection pool) and sampling method is called simple random sampling. Convenient sampling method can be defined as collection of data from sample where researcher can easily access (Büyüköztürk, Kılıç,

Çakmak, Akgün, Karadeniz, and Demirel, 2017). Demographic information of this study group were summarized in the table below:

Table 1. Demographical Information of Participants

		<i>f</i>	%
Gender	Female	27	45.00
	Male	33	55.00
Education	Associate degree program	7	11.67
	Education Faculty	39	65.00
	Faculty of Science-Literature	10	16.67
	Other	4	6.66
Seniority	0-5 year	0	0.00
	6-10 year	2	3.33
	11-15 year	7	11.67
	16-21 year	18	30.00
	21-25 year	11	18.33
	26+	22	36.67

When demographic information table of participant teachers were analysed, it can be seen that 45% of teachers were female and 55% of teachers were male. Besides, 11.67% of teachers had two-year degree, 65% were Education Faculty graduates, 16.67% were Science-Literature Faculty graduate, and 6.66% were graduates of other faculties (agriculture etc.). When seniority of teachers participated in the study were considered, 3.33% were working between 6-10 years, 11.67% were working between 11-15 years, 18.33% were working between 21-25 years, and 36.67% were working more than 26 years.

## 2.2. Data Collection Tools

In this study investigating problems and reasons faced by participants were analyzed with interview forms structured with open-ended questions

Following questions are in the interview form:

What are the problems and reasons teaching problem-solving skills in mathematic course?

What are the positive or negative attitudes of students while primary teachers are teaching problem-solving skills?

Which strategies, methods and techniques do you use while teaching problem-solving skills?

Do you use instructional materials while teaching problem-solving skills? If yes, which instructional materials do you use?

Do you have any recommendations suggestions for solution? If yes, what are they?

### 2.3. Data Analysis

Data obtained from the study were evaluated and interpreted with descriptive analysis. Answers of teachers to open-ended questions were presented in table form according to frequencies.

### 3. Findings

In this study which was conducted to determine problems faced by primary school teachers while teaching problem-solving skills as well as reasons, and suggestions for solution, findings were presented as follow.

Problems faced by primary teachers while teaching problem-solving skills and reasons are presented in table 2:

Table2. Problems Faced by Primary Teachers While Teaching Problem-Solving Skills and Reasons

<i>Source for Problems</i>	<i>Problems</i>	<i>f</i>
Student based	Misreading problem and not understanding	27
	Incomprehension Problems	20
	Non-materialisation	12
	Low level of readiness	7
Program based	Intense course schedule	1
	Inadequate question levels	1
Teacher based	Increased operation number	1
	Unable to reach the level of student	1
	Providing no preparation	1

As seen from findings on Table 2, the most important problem and reasons faced by teachers while teaching problem solving skills to students were student based and these were “misreading problem” (27 times), “incomprehension of problem” (20 times), and “non-materialisation” (12 times). Some of the answers of teachers were presented below:

T17, *“Students who have poor reading habits are struggling to understand problems and they are unable to solve simple problems.”*

T30: *“Since students do not understand the problem while they are reading, they make mistakes in solution.”*

T38: *“...Since our students in material operation period, they fail to imagine and think of the problem. Showing each problem with model is a waste of time. Especially, I am having trouble in problems that require two operations or in questions where whole is asked.”*

T36: *“...since most of the students do not read books, they are having problem to understand what they read.”*

T59: *“Of course we all have problems. Students cannot understand the problem they read, understand which four operations will come first. Since problem solving skill is depending on experience of children, some of them are struggling as they have weak relationship with their families, money around them, or objects”.*

T28 *“...they are having problems in understanding and interpreting.”*

“Intense course schedule”, “mismatching between questions and syllabus course program”, and “inadequate question level” are among program-based problems. “Unable to match student level”, and “providing no preparation” are among teacher-based problems. Some of the answers of teachers are presented below:

T9: *“...Some of the questions in the course book may not fit level of students.”*

T11: **“We are experiencing in certain periods. They are struggling when number of operations increase.”**

T19: *“...It is basically caused by unable to match the world of children.”*

Attitudes of students while primary teachers are teaching problem –solving skills are presented in table 3:

Table 3. Attitudes of Students Primary Teachers While Improving Problem-Solving Skills (Organize Table Like the Second One)

<i>Positive/negative attitudes</i>	<i>Student attitudes</i>	<i>f</i>
Positive attitudes	Faith for success	6
	Self-confidence	4
	Courage	3
	Liking course	1
	Objects they like	1
	Lack of self-confidence	6
	Fear	4
Negative attitudes	Prejudice	3
	Lack of listening, reading, and following skill	2
	Negative attitudes of family	2
	Negatives attitudes towards teacher	2
	Lack of motivation	1
	Indifference	1
	Students with behaviour problems	1
Not liking course	1	

According to Table 3 created based on teacher views positive/negative attitudes of problem solving skills of students, when positive attitudes for teaching problem solving skills were considered, “faith for success” (6 times), “self-confidence” (4 times), and “courage” (3 times) were dominant. Negative student attitudes when teachers teach problem solving skills to students were “lack of self-confidence” (6 times), and “fear” (4 times). Some of the opinions of teachers were presented below:

T36: “While students with positive attitudes have positive effect on learning with self-confidence, learning of students with negative attitudes such as prejudice are negatively affected.”

T38: “...students who lack of self-confidence or feel impartial cannot improve problem solving skills...”

Strategies, methods and techniques while teaching problem solving skills are presented in table 4:

Table 4. Strategies, Methods, and Techniques While Teaching Problem Solving Skills

<i>Methods and Techniques</i>	<i>F</i>
Explaining	22
Learning with doing and experience	18
Question-answer	17
Learning with drama/scenario	16
Materialising	9
Teaching with invention	7
Reasoning	6
Gamification	6
Showing and making them do	4
Show	4
Creating model	4
Brainstorming	3
Ladder technique	1
Deduction	1
Diagram technique	1
Visual explanation	1
Written explanation	1

Table 4 contained strategies, methods, and techniques used by primary teachers while teaching problem solving skills and findings showed that explaining (22), learning with experience and doing (18), question-answer (17), teaching with drama/scenario (16), materialisation (9), teaching with invention (7) were most common strategies, methods, and techniques. Some of the answers of teachers about this subject were presented below:

T21: *"I am frequently using open ended questions to attract attention and motivation. I am using technology as much as I can...Most importantly, I am thinking of oral and visual games to make mathematic enjoyable and lovable."*

T26: *"Explaining, question-answer, teaching with games, teaching with scenario, showing."*

T37: *"I can say learning with experience and doing. Especially for elementary 1st, 2nd, and 3rd grades, this method is indispensable. But in 3rd and 4th grades, I use different teaching techniques. I am considering individual differences of my students and I am trying to combine different techniques."*



T55: *"I am using reading, understanding, teaching, and drama techniques. I am using them in problem solving stages."*

Instructional tools and materials while teaching problem-solving skills are presented in table 5:

Table 5. Instructional Tools and Materials While Teaching Problem-Solving Skills

<i>Tools and Materials</i>	<i>f</i>
Mathematic tools and materials	41
Daily objects/food	22
Classroom Objects	20
Technologic tools	16
Measurements	13

Table 5 consisted of instructional tools and materials by primary teachers while teaching problem solving skills and these tools consisted of mathematic tools and materials (41 times), daily objects (22 times), course objects (20 times), technologic tools (16 times), and measurements (13 times). Some of the answers of teachers were presented below:

T13: *"Based on the problem, I use class objects, clipper, counting beans, pen, or stick."*

T19: *"...Geometric tools (compass, mitre and protractor) we are using shapes and schemes for numerical problems..."*

T38: *"Course book, smart board, counting beads, all objects that can be counted, cardboard, colourful papers, various fruit, real money in money section. In higher grades (3<sup>rd</sup> and 4<sup>th</sup>), we are using ratio cards, decimal, unison, and hundred blocks."*

T60: *"...Tools and materials of daily life. Ruler, compass, mitre, pattern blocks, unit cubes, tangrams."*

Suggestions for solutions of teachers to problems faced while teaching solving skills are presented in table 6:

Table 6. Suggestions for Solutions of Teachers to Problems Faced While Teaching Solving Skills

	<i>Suggestions for Solutions</i>	<i>f</i>
Expectation from teachers	Exchange between colleagues	22
	Applying problem solving steps	13
	Materialising	13
	Gamification, dramatization	13
	Endearing mathematics	11
	Problems/course subjects for level of students	10
	Teaching from simple to complex	8
	Repetition	7
	Encouraging active participation	7
	Showing success	6
	Using various tools and materials	6
	Personal development of teacher	4
	Showing problem in pieces	3
	Individually paying attention to students	3
	Applying activities	1
Identifying keywords	1	
Expectations from students	Reading habits	22
	Thinking and interpreting exercises	4
Expectation from authorities	Lighter syllabus	4
	Better school-course physical conditions	1
	Raising qualified teachers	1
	Increasing mathematics course hours	1
Expectations from parents	Relating with daily life	15
	Family support	6

According to Table 6, prepared for problems faced by primary teachers while teaching problem-solving skills and suggestions for solutions, expectations from teachers are exchange between colleagues (22), gamification, dramatization (13), materialisation (13); expectation from students are having reading habit (22); expectations from authorities are lighter syllabus (4); expectation from parents are relating with daily life (15). Some of the answers of teachers are presented below: %15:

T37: "*Sense of accomplishment of problem-solving skills by feeling proud with enthusiasm can be provided. In terms of 'course times' and 'textbooks', fundamental changes can be made to relax teachers and accelerate learning.*"

T38: *“Teachers should select problems from hard to easy so that students will think “I can do it”. Students should be encouraged. Problems should be gamified. Examples from daily life should be given. Problem should be clear.”*

T44: *“If there is any problem about problem solving in any course, first, without repeating the mistake, the mistake should be eliminated at the first stage.”*

T47: *“I would recommend asking for help from other experienced teachers, benefiting from applications on education sites, loving mathematics course, and help student to love this course.”*

#### **4. Results and Discussion**

Problems faced by primary teachers while teaching problem-solving skills are grouped under three sections namely, “student based”, “program based,” and “teacher based”. Within “student based” group that created the main problem, the most repetitive problem is “misreading the problem and unable to understand the problem”. Program and teacher-based problems are at least repetitive problems.

When literature was reviewed, there are various studies supporting these findings. For instance, in the study of Alan (2009), it was stated that majority of the student had no problem in application of problem solving processes, however, students who faced problems were struggling to understand the problem and applying the decided operation. Additionally, when living region and environmental factors of students are considered, it is determined that due to ineffective use of Turkish, students fail to understand the problem and understanding planning stages clearly. Kazez (2015) has found that the most common mistakes among students are misreading or unable to understand what the question asks clearly. Aydoğdu İskenderoğlu and Uzuner (2017) have determined that primary school teachers consider themselves partly competent in teaching mathematical skills due to the students’ low perception and indifferent, indifferent parents, class level, teacher-induced causes, unified classroom practice.

While “liking the course”, and “objects they like” are among positive attitudes, “lack of motivation”, “students with behaviour problems”, and “not liking the course” are the least repetitive negative attitudes.

When literature is reviewed, there are various studies supporting these findings. For instance, Öğülmüş (2001) has determined that “as an individual, thoughts such as considering a solution of a problem difficult, thinking that it is impossible to solve the problem, belief for inadequate opportunities, feeling desperate, and being hurry up to solve the problem are among negative thoughts that hinder solution of the problem” (As cited

in. Mutlu Aydın, 2013, p. 56). In the study of Sezgin (2007), it was found that there was negative relationship between students' achievement and their mathematics anxiety.

This result has indicated that as students' mathematics anxiety increases, their achievement decreases. Alan (2009) investigated emotional properties of students in problem solving process and found that more than half of the students were "feeling happy and good in problem solving processes, they felt self-confidence; they were happy and excited to solve problems". Mutlu Aydın (2013) determined that "positive opinions during problem solving may prevent avoiding behaviour". Findings of Mutlu Aydın are similar to finding of this study.

While direct instruction, learning through experience , question-answer and learning through drama / scenario are the most repetitive strategies, methods and techniques used by primary school teachers while teaching problem-solving skills, ladder technique, diagram technique, deduction, multiple intelligence, visual explanation, and written explanations are the least repetitive strategies, methods and techniques.

Kazem (2015) has found that students understand the problems easier when abstract concepts are materialised with Lego pieces. It has been determined that modelling contributes students to reach correct answers by minimise time to solution. Gür and Hangül (2015) found that "solving a problem is not always possible, it has to reach the level of readiness to solve the problem and the problem must be understood that the solution of a problem can take place by using multiple strategies rather than just one way".

While "mathematics tools and material" are the most repetitive ones among the instructional tools and materials used by primary teachers while teaching problem-solving skills, "Daily objects", " course objects", "technologic products", and "measurements" are following.

When suggestions for solution are classified according to teachers' opinions, "expectations from teachers", "expectations from students", "expectations from authorities", and "expectations from parents" are main subjects. Among "expectations from teachers", the most repetitive one is "exchange between colleagues". Most repetitive items among "expectations from teachers" are "gamification", "dramatization", "materialization", "teaching from simple to complex", and "enabling active participation"; most repetitive item among "expectations from students" is "gaining reading habit"; most repetitive item among "expectations from authorities" is "lighter curriculum"; most repetitive item among "expectations from parents" is "relating with daily life".

In the study of Özçelik (2011), it is identified that comprehension skills in Turkish courses had significant effect on success of other courses and full gain or shortcoming in this skill reflected to Student's academic achievement and learning mainly developed based on comprehension skill. In the study of Türnüklü (2005), it has been determined that problems relating with daily life will enable individuals to find a solution even if they have no idea about that field. Finding of Özçelik (2011) and Türnüklü and Yeşildere (2005) support the findings of this study.

To minimize problems faced by primary teachers while teaching problem-solving skills and reasons, followings are recommended:

In this study, it has been found that "lack of self-confidence" is among the negative attitudes of students towards problem solving skills while primary teachers are teaching problem solving skills. Therefore, primary teachers need to work on providing self-confidence to students to prevent or minimize positive/negative attitudes towards problem solving skills and include simpler problems to increase self-confidence of students, and reinforce belief of success.

In this study, it has been found that the most repetitive one is "misreading problem and not understanding" among the student based problems. In other words, one of the most important problems faced by primary teachers while teaching problem solving skills to students is the problems of reading and unable to comprehend what they read. It is recommended that primary school teachers should focus on reading, understanding, and interpreting activities as Ministry of National Education emphasized in "Elementary Turkish Course Teaching Program"

It is recommended that primary school teachers should be supported to take part in service training that will enable them to increase their mathematical reasoning skills, and develop strategies, methods, and techniques for teaching problem solving.

It is recommended that the shortcomings of primary teachers in mathematics field should be determined, and anxieties and fears of teacher candidates should be analysed. Thus, future studies can focus on these aspects.

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