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THE OPINIONS OF PRIMARY SCHOOL TEACHERS ON GAINING PROBLEM POSING SKILL IN MATHEMATICS COURSE*

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ABSTRACT

The aim of this study is to determine the opinions of primary school teachers on gaining problem posing skill in mathematics course. The qualitative research method was used in this study. The participants of the study consist of fourteen primary school teachers working at different classroom grades at primary school. The semi-structured interview technique and the interview form prepared by the researchers were used to collect the data. The data of the study were analyzed with the NVIVO10 program and content analysis was used in the data analysis. As a result of the analysis performed, it was found out that primary school teachers expressed their opinions under the themes such as problem posing activities implemented in the mathematics course, the effects of problem posing on students, the knowledge and skills regarding problem posing, students' problem posing skills, difficulties and problems experienced in problem posing activities and suggestions to develop problem posing skills and solution proposals.

Keywords: Primary school mathematics education, primary school teachers, problem posing, teachers' opinions.

SINIF ÖĞRETMENLERİNİN MATEMATİK DERSİNDE PROBLEM KURMA BECERİSİ KAZANDIRMAYA YÖNELİK GÖRÜŞLERİ

ÖZ

Araştırmanın amacı, sınıf öğretmenlerinin matematik dersi kapsamında problem kurma becerisi kazandırmaya yönelik görüşlerinin belirlenmesidir. Araştırma, nitel araştırma yöntemiyle gerçekleştirilmiştir. Araştırmanın katılımcılarını, ilkokulda farklı sınıf düzeylerinde görev yapmakta olan on dört sınıf öğretmeni oluşturmaktadır. Araştırma verilerinin toplanmasında yarı yapılandırılmış görüşme tekniği çerçevesinde, araştırmacılar tarafından hazırlanan görüşme formu kullanılmıştır. Araştırmada elde edilen verilerin analizi, NVIVO10 programıyla gerçekleştirilmiş olup veri analizinde içerik analizi kullanılmıştır. Gerçekleştirilen analizler sonucunda sınıf öğretmenlerinin, matematik dersinde yer verdikleri problem kurma etkinlikleri, problem kurmanın öğrenciler üzerindeki etkileri, problem kurma konusunda sahip olunan bilgi ve beceriler, öğrencilerin problem kurma becerileri, problem kurma çalışmalarında karşılaşılan sorunlar, zorluklar ve çözüm önerileri ile problem kurma becerisini geliştirmeye yönelik öneriler temaları altında görüş belirttikleri sonucuna ulaşılmıştır.

Anahtar Kelimeler: İlkokul matematik eğitimi, sınıf öğretmenleri, problem kurma, öğretmen görüşleri.

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1.INTRODUCTION

Problem posing is defined as creating a problem based on a situation or an experience or generating a new problem from a given problem (Silver, 1994). According to Stickles (2006), problem posing is the process of generating a problem from a given case or situation. Based on these definitions, it can be said that problem posing means creating a new problem from a situation or a problem. Problem posing is one of the keys to mathematical discovery, and problem posing is seen as more significant than finding solutions to the problem (Cai, 2003). Problem posing involves generating new ideas through different ways by the learner (Kojima et al., 2009). Based on all of these, it can be said that problem posing enables learners to form a deep thinking composition. Problem posing enhances students' mathematical development as it enables students to actively participate in designing their problems, solving open-ended problems, and testing and proving their assumptions. Problem posing activities also encourage children to focus on the basic structures of the problem and to use them as a resource for creating new problems (English & Halford, 1995). In other words, problem posing helps students to see a standard issue from a new perspective and allows students to understand more deeply. Problem posing also encourages students to produce new ideas from any given issue (Brown & Walter 1990). In problem posing, students face a complex situation and take responsibility. A problem posing activity forces students to really understand the problem and also reinforces the idea that problem solving is a process and understanding everything about the problem before starting the solution of a step in the process (Akay, 2006). Problem posing also enables individuals to recognize problems in real life and to solve these problems with a critical view (Turhan, 2011). As can be seen, all these features indicate that problem posing has a significant effect on students.

Problem posing is an important activity for both students and teachers (Kılıç, 2013a). Considering that students' problem posing skills are related to teachers' approach to problem posing, teachers should organize problem posing activities for their students (Arıkan & Ünal, 2015). In this respect, teachers should have a perspective on problem posing activities (Katrancı & Şengül, 2015). Teachers, who aim to gain problem posing skill to students, support students' active participation in structuring their mathematical knowledge (Whitin, 2004). Besides, one of the main components of problem posing is the teacher; teacher creates a suitable productive classroom climate to support problem posing, sets a model for students on this issue, encourages students to share their ideas mutually by making them active in a cooperation (Moses et al., 1993). It is also stated that teachers can use problem posing as an evaluation tool (Işık et al., 2012). In addition, it is also stated that problem posing can be described as a teaching method when teachers pose problems for their students and when students pose problems according to their interest problem posing is can be described as a teaching activity (Cantürk-Günhan et al., 2019). Based on these views, it can be said that teacher is an important factor for students to gain problem posing skills; therefore, the teacher should have knowledge and skills for implementing of problem posing activities. In this context, Kılıç also (2012) suggests that in-depth interviews should be conducted with teachers and that their opinions should be revealed to improve problem posing skill of students. Accordingly, it is important to determine teachers' opinions about gaining of problem posing skill by students.

In mathematics, problem posing is defined as the process of creating a problem based on a specific situation or a case (Stickles, 2006). However, it is stated that problem posing has a strong effect on problem solving skill (Grundmeier, 2003). Furthermore, it is thought that problem posing, along with problem solving, is at the center of mathematics education and mathematical thinking (Silver, 1997). In many studies in the literature, it is stated that problem posing has various effects on mathematical skills. It is suggested that problem posing activities should be included in the primary school mathematics curriculum in Turkey (MNE [Ministry of National Education], 2015). Accordingly, the design of suitable learning-teaching processes by teachers for gaining of problem posing skills becomes important (Aydoğdu-İskenderoğlu & Güneş, 2016).

When the studies on problem posing at the primary school level were examined, it was determined that primary school second-grade students had difficulty in problem posing, had misconceptions and could not use the Turkish language well (Arıkan & Ünal, 2013), and that primary school teachers considered problem posing and problem solving as the same, some teachers gave irrelevant answers for problem posing, and some of them could not make an explanation (Kılıç, 2014). In this regard, it is also stated that teachers are inadequate in problem posing (Albayrak et al., 2006) and that there are significant deficiencies in the problems they pose (Kar & Işık, 2015). In a study examining mathematics curricula, it was stated that problem posing was included in some learning areas while it was not included in other learning areas (Kılıç, 2011). Besides these studies, there are also various studies conducted with preservice primary school teachers. Within the scope of these studies, it has been determined that the number of preservice primary school teachers who can pose different problems is low, they have difficulty in posing some problems, the types of the problems they pose are limited, they prefer to pose simple problems more (Işık & Kar, 2012) and they have various problems in problem posing (Kılıç, 2013b; Xie & Masingila,2017). Based on these studies, it can be said that students, teachers and preservice teachers at the primary school level have troubles in problem posing and that it is necessary to produce solutions to these problems experienced. Based on this requirement, revealing the problems by examining the existing practices and producing solutions to these

problems will create positive effects on the development of primary school students' problem posing skills and on the reflection of them on preservice primary school teachers' courses for teaching mathematics. Accordingly, it can be said that it is important to determine primary school teachers' opinions about problem posing.

It is stated that problem posing is a reflective and dynamic process that enables students to think about their perceptions about mathematics, as well as enabling students to integrate their mathematical knowledge and skills. It is also stated that it helps students develop their reasoning and communication skills, think flexibly, realize their potential and evaluate themselves (Kılıç, 2014). In a meta-analysis of studies conducted in Turkey for the problem posing based mathematics education, it was determined that problem posing based mathematics education had a significant and positive effect on students' success (Cantürk-Günhan et al., 2019). In a meta-analysis study conducted for problem posing abroad, it was determined that problem posing activities contributed to mathematics success, problem solving skills, levels of posed problems and attitudes towards mathematics (Rosli et al., 2014). In a study conducted in primary school, it was determined that problem posing and problem solving are related (Limin et al., 2007). It is stated that problem posing activities in primary school mathematics teaching can be used as a tool to improve creativity and mathematical thinking (Mihajlović & Dejić, 2015). In a study conducted with sixth, seventh and eighth grade students, it was found that students at the upper grade level were less successful to pose problems and had lower self-efficacy beliefs towards problem posing than students at lower grade levels (Özgen & Bayram, 2020). In line with this research, it turns out that it is important to start problem posing activities in lower grades. It has been determined that students who have experience in problem posing activities in primary school are more successful in problem posing. It has been stated that it is important for students to conduct problem posing activities and to gain experience in this field since the first years of primary school (Güveli, 2015). Accordingly, teachers are recommended to implement problem posing activities in their lessons in order to increase students' success (Cantürk-Günhan et al., 2019). Based on this, it is thought that implementing problem posing activities in primary school will have positive effects on students. Besides, it was determined that there is no activity on problem posing in mathematics textbooks for primary school level and accordingly, it was proposed to include problem posing activities in textbooks and at courses (Deringöl, 2020). In this context, it is important to investigate the current situation for problem posing in Turkey at the primary school level.

Based on these statements, the general aim of the study was to determine primary school teachers' opinions about gaining of problem posing skills within the scope of the mathematics course. In line with this general aim, it was purposed to determine the problem posing activities included in the mathematics course by primary school teachers, the effects of problem posing activities on students, primary school teachers' knowledge and skills related to problem posing, the problem posing skills of students, the problems and difficulties encountered in the gaining of problem posing skills and the solution proposals for it, and primary school teachers' suggestions for the gaining of problem posing skills.

2. METHODS

2.1. Research model

The phenomenology design, one of the qualitative research designs, was used in the study. In the phenomenology design, an attempt to explain and understand the meaning, structure and nature of a phenomenon experienced by a person or a group of people is made (Patton, 2002). In this study, an attempt to understand the opinions of primary school teachers implementing problem posing activities in mathematics course was made on the basis of their experiences in the implementing of problem posing activities.

2.2. Participants

In phenomenological studies, individuals who have experienced the phenomenon on which the study has focused and who can express and reflect on this phenomenon are the sources of data (Yıldırım & Şimşek, 2008). Therefore, this was taken into account while determining the participants of the study. Accordingly, the criterion sampling method, one of the purposeful sampling methods, was conducted while determining the participants of the study. The criteria that were considered in the criterion sampling method were determined as the facts that the participants should work as primary school teachers in third and fourth grades and that they should include problem posing activities in the mathematics course. Besides, volunteerism was taken as a basis for participation in the study. Fourteen primary school teachers working at different grades in primary school in Çukurova and Yüreğir districts of Adana province constituted the participants of the study. Information about the characteristics of the participants is presented in Table 1.

Table 1.
Information about the Participants' Gender, Age, Professional Experience, Type of School where They Work, and Grade Levels

Participant Code	Gender	Age	Professional Experience (Year)	Type of School	Grade Level
PT1	M	60	35	Medium SES	4
PT2	F	52	30	Medium SES	4
PT3	M	53	29	Medium SES	3
PT4	M	44	21	Medium SES	4
PT5	M	60	37	Medium SES	3
PT6	M	60	28	Medium SES	3
PT7	F	43	20	Upper SES	4
PT8	F	37	15	Upper SES	3
PT9	F	44	25	Upper SES	3
PT10	F	51	30	Upper SES	4
PT11	F	47	18	Lower SES	3
PT12	M	54	20	Lower SES	4
PT13	M	48	27	Lower SES	3
PT14	F	47	19	Lower SES	4

2.3. Data collection and analysis

In phenomenological studies, interviews are the main data collection tools and they are held for a longer time since the data obtained from interviews will be examined in-depth (Yıldırım & Şimşek, 2008). Based on this recommendation, the interview form consisting of fifteen questions prepared by the researchers within the frame of a semi-structured interview technique was used in data collection. The expert opinion was taken in the generation of the interview form, and the pilot application was also performed for the form. The interviews were conducted at the schools where teachers worked. The average duration of each interview was twenty-five minutes and the interviews were held in June of 2016. The data of the study were analyzed with the NVIVO10 program and content analysis was used in the analysis of the data. Within the framework of the content analysis, the written transcripts of the interviews were coded, and the themes were generated by combining the relevant codes.

In this study, the researchers developed the data collection tool together, one researcher collected and analyzed the data, the other researcher wrote the interviews to the computer and controlled the analysis.

Within the scope of the validity and reliability studies for data analysis, the codes and themes that emerged in the content analysis performed by a researcher were examined by the other researcher, and expert opinion was taken for the consistency and suitability of the codes and themes.

3. FINDINGS

Primary school teachers' opinions about problem posing in mathematics course were gathered under fifteen themes within the scope of including problem solving, the activities performed for problem posing, the effects of problem posing, the relationship between problem posing and problem solving, the qualifications that the teacher should have for problem posing, the information possessed about problem posing, the state of gaining the problem posing skill in an effective way, the state of evaluating the problems posed, the grade at which problem posing should be started, the problem posing skill levels of students, the prerequisites for students to be able to pose a problem, problem posing activities in the textbooks, the problems related to problem posing, the source of the problems related to problem posing, and the solution proposals for the improvement and the problems of problem posing. The sub-themes under these themes are respectively explained below.

The theme of including problem posing involves two sub-themes consisting of the state of including and the frequency of including. The sub-themes and codes for this theme are presented in Figure 1. Regarding the state of including, most of the teachers stated that they included problem posing activities (f:12) while two teachers stated that they less often included problem posing activities. However, within the scope of the theme of including, most of the teachers stated that they included problem posing activities at the end of each subject/unit (f:12). Except this, the codes of including after solving the problem related to the subject (f:5), including as much as it is included in the textbook (f:3), including several times a week (f:2), not focusing too much on it (f:1), including very often (f:1), including between the subjects (f:1), and varying by the nature of the subject (f:1) are also included under the sub-theme of the frequency of including. Within the scope of this theme, while PT2 said *"We include it at the end of units, at the end of themes. However, we cannot focus too much on it because the number of courses allocated to us is small."*, PT10 also gave a similar answer by stating that *"Mainly, well, mathematics comes to*

our mind especially when you say problem posing in mathematics. At the end of each unit, now, you are taking a subject, for example, you are taking the angles, you are teaching the angles, you are doing examples, afterwards, finally we finish with problem posing."

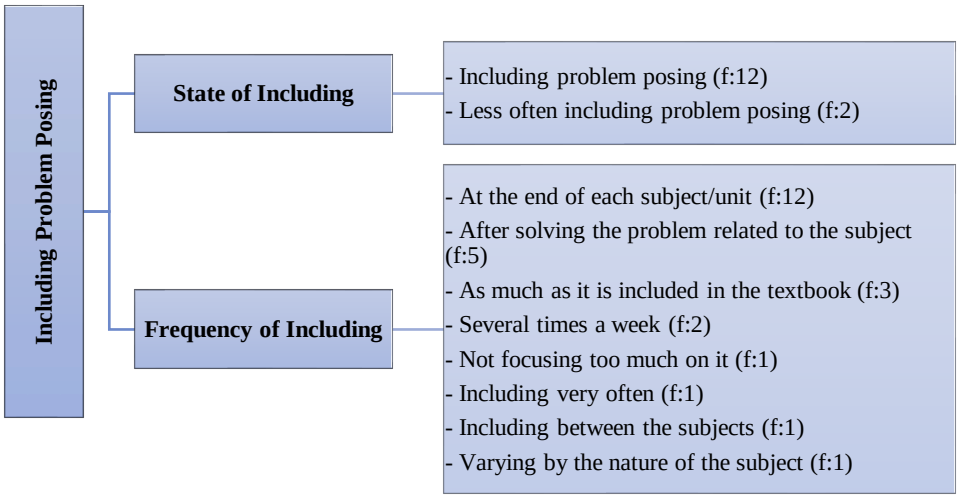

Figure 1. The state of including problem posing

Within the scope of the theme of the activities performed for problem posing, three sub-themes were created as the problem posing strategies included, the paths followed, and the sources used. The sub-themes and codes for this theme are presented in Figure 2. Within the scope of the sub-theme of the problem posing strategies included, it was determined that most of the teachers included the semi-structured problem posing strategy (f:11). However, within the scope of the problem posing strategies included, teachers stated that they also included the structured problem posing (f:6) strategy, free problem posing (f:6) strategy and creating problem stories (f:1) strategy. For this sub-theme, PT3 stated that he mainly included the semi-structured problem posing strategy in his courses by stating that *"Mainly with semi-prepared problems, I ask them to complete the rest of it, like this, Ali has 50 liras, he gets into a stationery shop. I am trying to improve by completing the problems, which are left incomplete, more easily."* Within the scope of the sub-theme of the paths followed, teachers mostly stated that the sharing the problems posed with the class (f:5), examples are given by the teacher firstly (f:4) and using cooperation for problem posing (f:3). However, within the scope of the sub-theme of the paths followed, the codes of giving homework for problem posing (f:2), making students pose the problem on the board (f:1) and including it after the subject is understood and the problems are solved (f:1) are also included. Within the scope of the sub-theme of the sources used, teachers expressed the situations of posing problem by referring to real life and immediate environment (f:3), benefiting from books (f:3) and using visual materials (f:2). With regard to posing a problem by referring to real life and immediate environment, PT8 expressed her opinions by stating that *"In other words, actually, it is mainly related to children themselves in the classroom, it is related to the skills they can realize in their daily lives, I mean, by giving the examples of everyday life from themselves because children enjoy it. Let's say the simplest one, let's say that the child's own name is mentioned while posing a problem, even this appeals to children."*

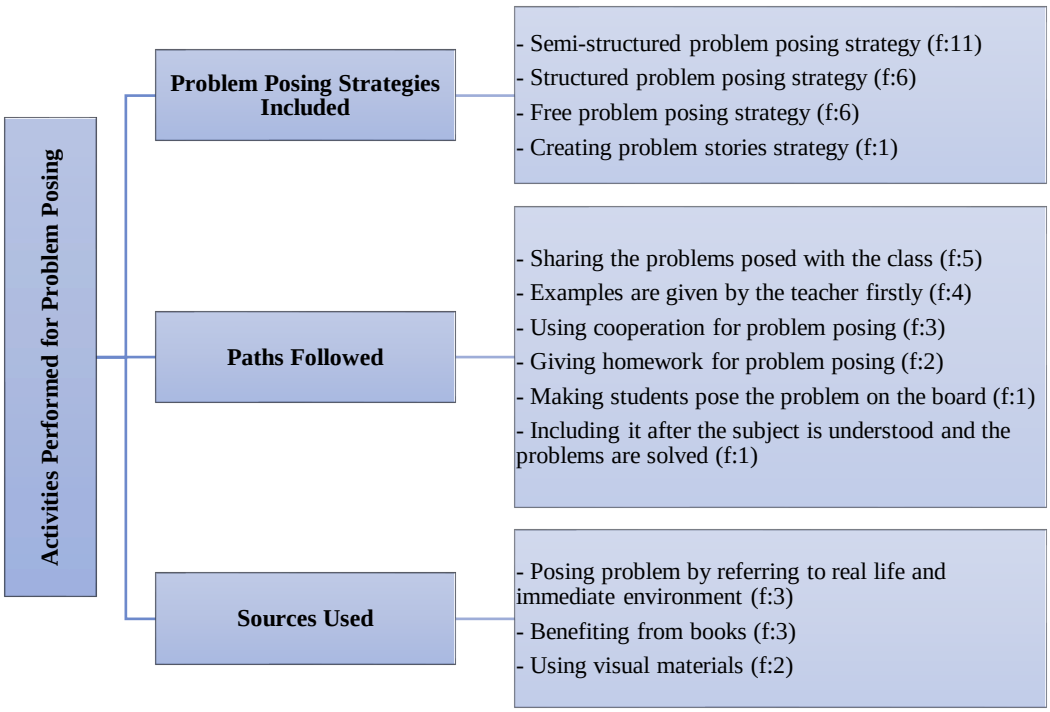

Figure 2. The activities performed for problem posing

The codes designated in line with the opinions about the effects of performing problem posing activities are gathered under three sub-themes consisting of its effects on cognitive development, its effects on affective development, and its reflections on life and classroom. The sub-themes and codes for this theme are presented in Figure 3. Within the scope of the sub-theme of its effects on cognitive development, the codes of developing problem solving skills (f:4), showing that the subject is grasped (f:3), realizing whether students have understood the subject (f:2), being able to solve real life problems (f:2), developing language skills (f:2), ensuring different thinking (f:2), being able to easily solve the problem he/she has posed (f:2), thinking about the solution while posing the problem (f:2), improving the use of four operations (f:1), increasing problem solving methods (f:1), developing mathematics (f:1), better understanding of the subject (f:1), ensuring practical thinking (f:1), and being successful in other courses (f:1) were also included. Within the scope of its effects on cognitive development, PT8 emphasized positive effects on problem solving by stating that *"Their problem-solving skills develop when they pose a problem, this is the most important. I mean, well, these may vary in children depending on the factors I have mentioned, but, children can reach the solution more quickly as they get this skill. In other words, they can reach the solution more easily when they pose it by themselves."* Within the scope of the sub-theme of its effects on affective development, the fact that performing problem posing activities has positive effects on establishing self-confidence (f:5) was mostly stated. Besides, the opinions about the development of imagination (f:2), ensuring motivation (f:1), and the feeling of doing something on his/her own (f:1) were also expressed. With regard to establishing self-confidence within the scope of this sub-theme, PT5 expressed that *"By improving the problem posing skill of the child, he/she sees his/her self-confidence, his/her command of the subject, and the steps that need to be developed in relation to the subject; especially his/her self-confidence, self-belief increase, he/she would say I can do this job, I succeed in such a study. At first, he/she gains self-confidence."* Finally, within the scope of this theme, the codes of ensuring a connection with life (f:2), ensuring being active (f:1), making course enjoyable (f:1), and ensuring in-class sharing and interaction (f:1) are included in the sub-theme of its reflections on life and classroom.

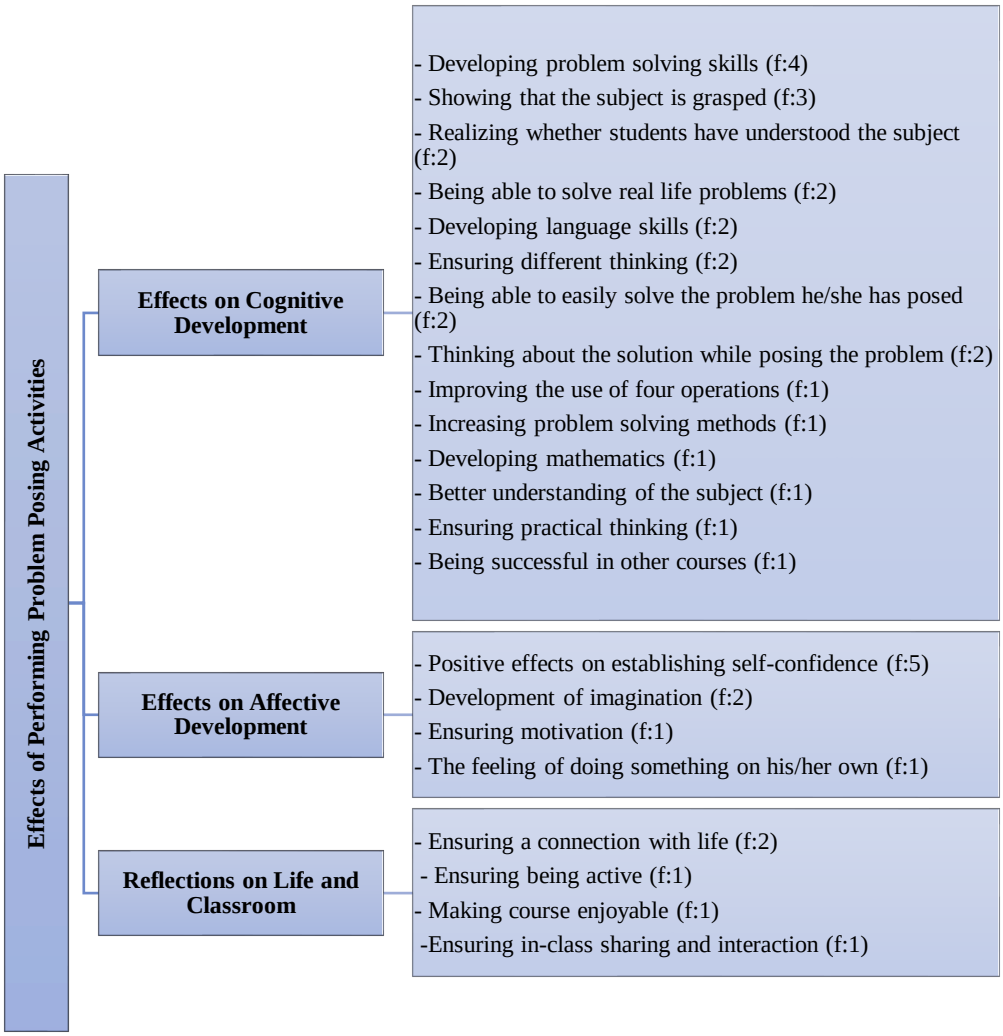

Figure 3. The effects of performing problem posing activities

Within the scope of the relationship between problem posing and problem solving, two sub-themes were created as the differences in terms of qualifications and the relationships in terms of being a prerequisite. The sub-themes and codes for this theme are presented in Figure 4. Within the scope of the sub-theme of the differences in terms of qualifications, teachers mostly stated that getting ready problems in problem solving while making an effort in problem posing (f:5) and that each problem solver may not pose a problem (f:5). However, the codes of the fact that each problem poser may not solve the problem (f:2), the fact that problem posing is more useful in terms of mental development (f:1), the fact that problem posing is more difficult than problem solving (f:1), and the fact that problem solving is an activity that requires academic knowledge and that problem posing is an activity that requires intelligence (f:1) are included within the scope of the sub-theme of the differences in terms of qualifications. Within the scope of this sub-theme, PT9 who said that *"It seems that posing a problem is more difficult and solving it is like ready-to-eat food, but, you prepare the food."* emphasized that problem solving is an activity that is received ready and that problem posing is an activity that requires effort by expressing that. PT14 also mentioned that each problem solver may not pose a problem by stating that *"However, I do not believe that problem posing is achieved by solving the problem, why, because he/she may have memorized the system, he/she may say that problem is like this based on it, you know, he/she may not pose a good problem, well, he/she can solve but may not pose a problem."* Within the scope of this sub-theme of the relationships in terms of being a prerequisite, most of the teachers stated that students who are able to pose problems can solve the problem (f:9) while some teachers stated that there were relationships in terms of being a prerequisite between problem solving and problem posing by stating that students who are able to solve problems can pose problems (f:3).

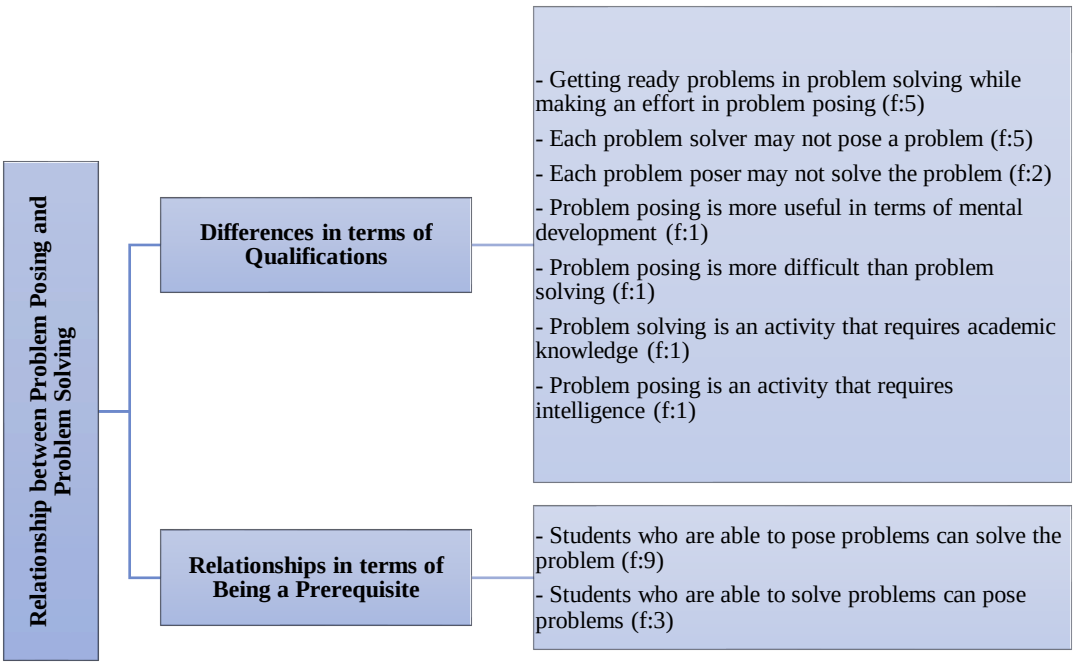

Figure 4. The relationship between problem posing and problem solving

Regarding the theme of the qualifications that teachers should have for problem posing, five sub-themes were created as qualifications for the subject area, qualifications for planning and practice, personal qualifications, qualifications for classroom management, and qualifications for the affective domain. The sub-themes and codes for this theme are presented in Figure 5. Within the scope of the theme of qualifications for the subject area, teachers mostly expressed their opinions about having a good mastery of the subject (f:3) and knowing problem posing (f:3). However, the codes of knowing different types of problems (f:1), presenting examples for problem posing (f:1), making realize the importance of problem posing (f:1), and knowing the stages of problem solving (f:1) are included within the scope of this sub-theme. The codes of knowing students' level and making them pose a problem according to the level (f:3), guiding students with clues (f:1), making students gain the ability to evaluate their knowledge (f:1), knowing different methods (f:1), being able to concretize by using materials (f:1), encouraging students to think (f:1), and being planned and prepared (f:1) are included within the scope of the sub-theme of qualifications for planning and practice. The codes of continuous self-renewal and development (f:3), rich vocabulary (f:1), being able to write a story (f:1), being able to think differently (f:1), and the fact that imagination is extensive (f:1) are included within the scope of the sub-theme of personal qualifications. Regarding the fact that imagination is extensive that is included within the scope of the personal qualifications that a teacher should have for problem posing, PT7 expressed his opinions by stating that *"First of all, imagination should be extensive, I mean, if imagination is not extensive, you already know what problem posing in teaching is at that moment, have a textbook, there is information given to you in the textbook. If you want to continue posing problems with children except for them, your imagination should be great so that you will be able to bring out different problems to those children and attract their attention within the time remaining there…"*

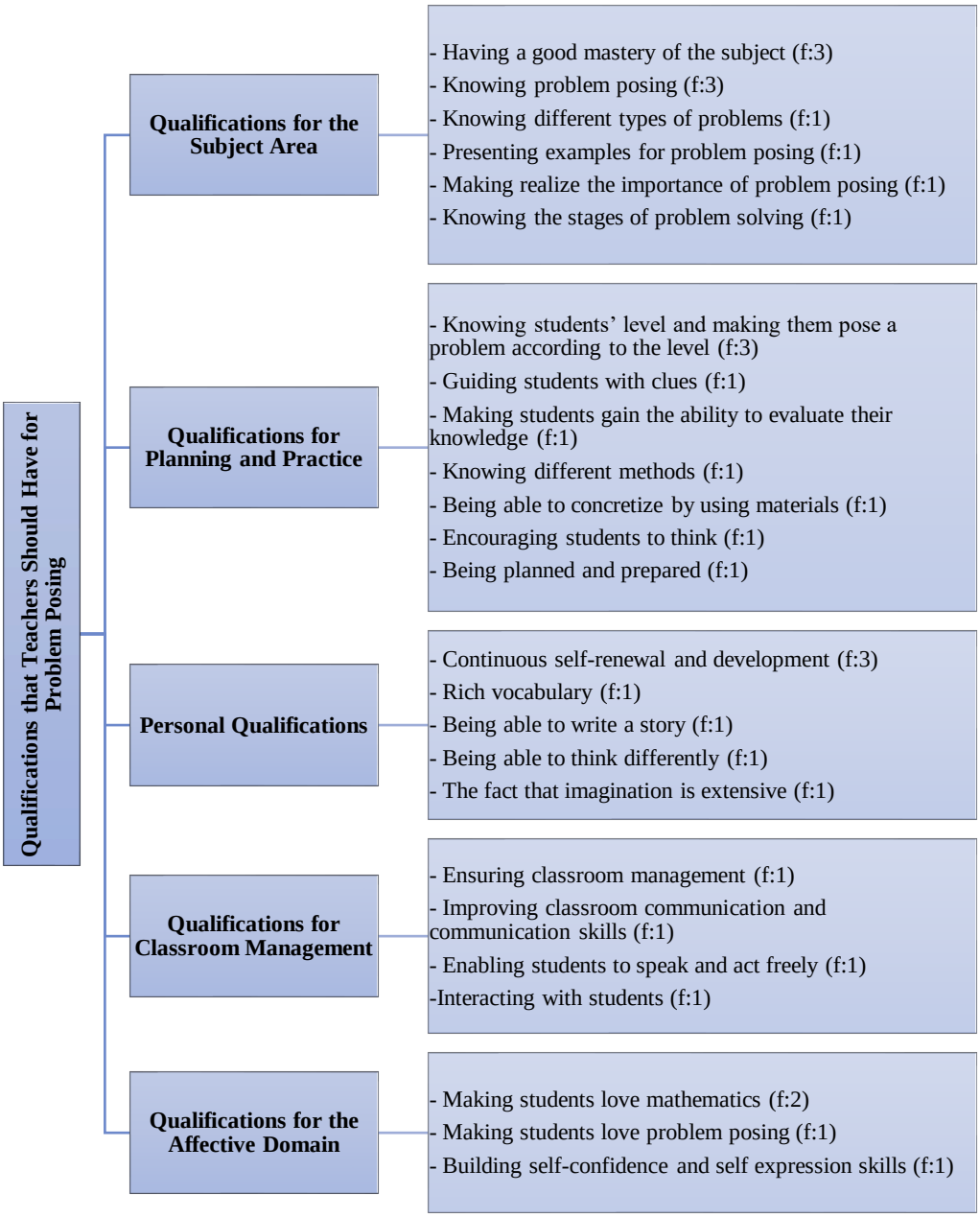

Figure 5. The qualifications that teachers should have for problem posing

Within the scope of the theme of the information possessed about problem posing, two sub-themes were created as the sources of knowledge gaining and the opinions about competence. The sub-themes and codes for this theme are presented in Figure 6. The codes of not considering himself/herself adequate (f:3), not having experience because of being newly included in the curriculum (f:1), needing for professional development related to problem posing (f:1), and seeing himself/herself adequate (f:1) are included within the scope of the opinions about competence. Within the scope of the sub-theme of the sources of knowledge gaining for problem posing, while all of the teachers stated that they did not get training on this subject, most of the teachers stated that they improved themselves in problem posing based on their own efforts and experiences (f:12). Within the scope of this sub-theme, the codes of learning from books and supplementary sources (f:4), sharing with group teachers (f:1), and learning with second-hand information (f:1) are also included. Within the scope of this sub-theme, while PT4 emphasized that he did not get any training by stating that *"We cannot say that we have too much good mastery of it because we have not got training on it, as I have already said, or, it has not been given to us on a regular basis."*, PT3 stated that he had not got any training and that they had performed problem posing activities with second-hand information by stating that *"It also comes together, I mean the problem, I give the problem posing course to children only with secondhand information because of myself, I have not learned it as a technique or a method."*

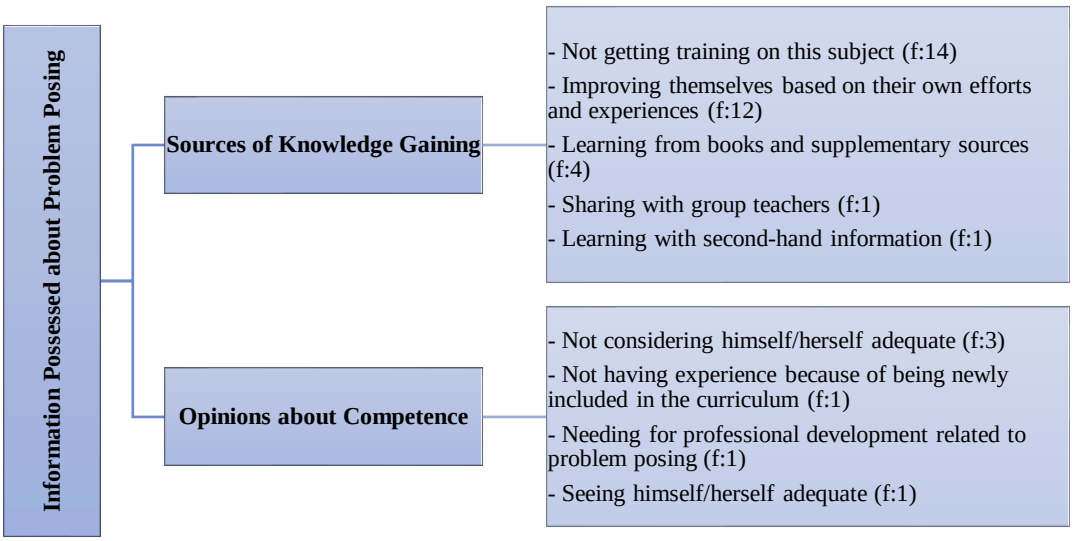

Figure 6. The information possessed about problem posing

Within the scope of the theme of the state of gaining the problem posing skill in an effective way, while six teachers partially believed that they effectively gain the problem posing skill, five teachers stated that they did not believe in it, and three teachers stated that they believed in it. These codes are presented in Figure 7. Within the scope of this theme, PT13 who said that *"Well, I definitely think that I am making an effort. Actually, I absolutely know that there is no situation disregarded by me, I think I am making an effort; however, if you need to evaluate it as a percentage, if you ask how successful I am, I just say that it is certainly not enough."* and PT5 who said that *"Well, let us not say 100% according to the grade level and the surrounding conditions, but at least, I believe that we have achieved it in problem posing by 50%."* stated that they partially believed that they effectively gain the problem posing skill.

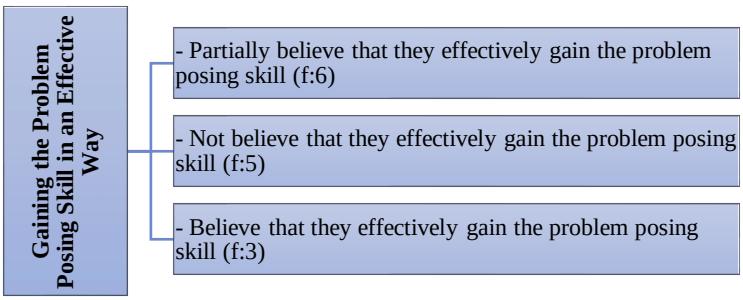

Figure 7. The state of gaining the problem posing skill in an effective way

For the theme of the state of evaluating the problems posed, two sub-themes were created as the ways of evaluation and the criteria considered. The sub-themes and codes for this theme are presented in Figure 8. Within the scope of the ways of evaluation, teachers mostly expressed their opinions about giving individual feedback-correction (f:7), evaluation with the class (f:5) and evaluation with awards and reinforcers (f:4). However, they expressed their opinions about the comparison with problems in books (f:1), not always controlling personally (f:1) and using the evaluation form (f:1). Within the sub-theme of the criteria considered, teachers stated that they mostly considered the criteria of including what is desired (f:6), language and expression (f:5), and the solution of the problem posed (f:4). However, they also stated that they considered the criteria of the number of operations used (f:3), being original and different (f:2), being related to the subject (f:2), being detailed (f:2), being compatible with the standards given in the curriculum (f:1), understanding the subject (f:1), using imagination (f:1), being consistent with the real life (f:1), difficulty level (f:1), and the level of the student (f:1). For this sub-theme, PT5 emphasized the language and expression and stated that he evaluated with awards and reinforcers by saying that *"If we pose a problem, it is necessary to form its frame, a problem statement at first, if the student can ask a question by bringing together the proper sentences and words, of course, I reward him/her by saying well done, I even make his/her friends applaud when he/she performs it well. Here, it is necessary to use the Turkish language well …"*

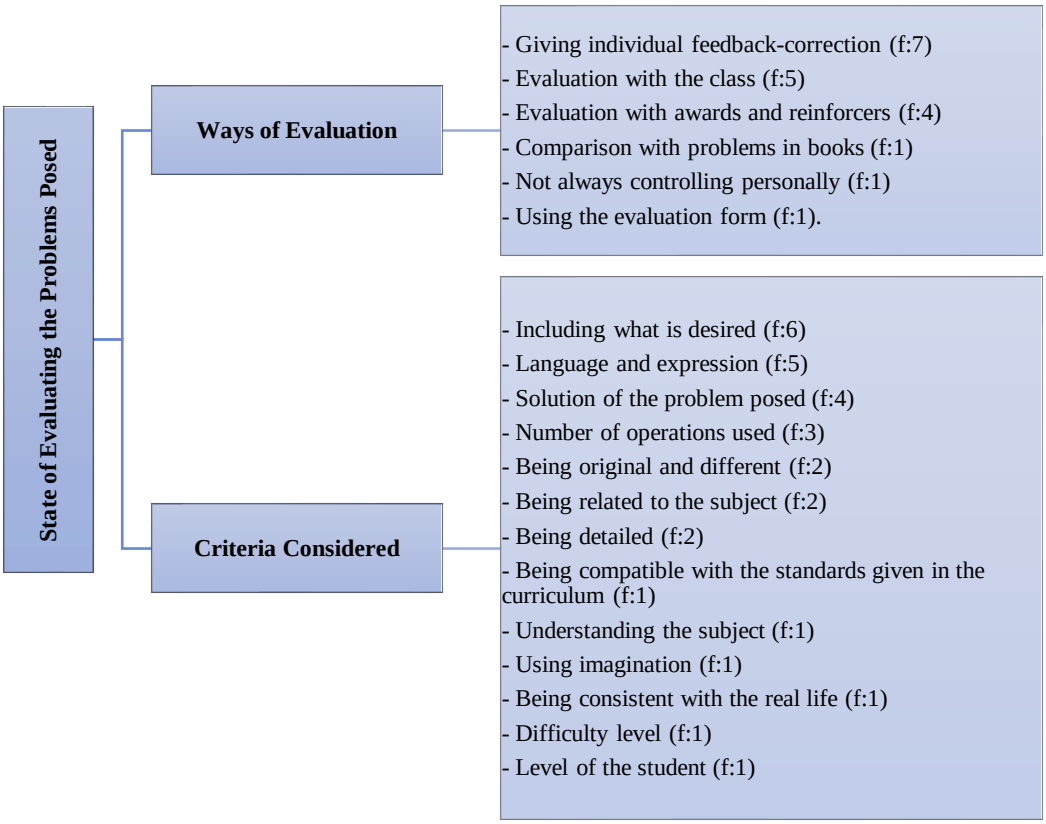

Figure 8. The state of evaluating the problems posed

Teachers' opinions about the grade at which problem posing should be started are aimed at four different grades. These codes are presented in Figure 9. Nine teachers stated that problem posing activities should be started in the first grade, two teachers stated that they should be started in the second grade, two teachers stated that they should be started before pre-school education, and a teacher stated that they should be started in the third grade. While PT4 mentioned that problem posing activities could be started with simple verbal problems in the first grade by stating that *"I think the habit of problem posing can be applied as of the primary school first grade, as it is also understood from the subject, I mean, to write and draw something numerically are not absolutely required. Because this can also be grasped with solving expressions, numerical things are not necessarily required for it."*

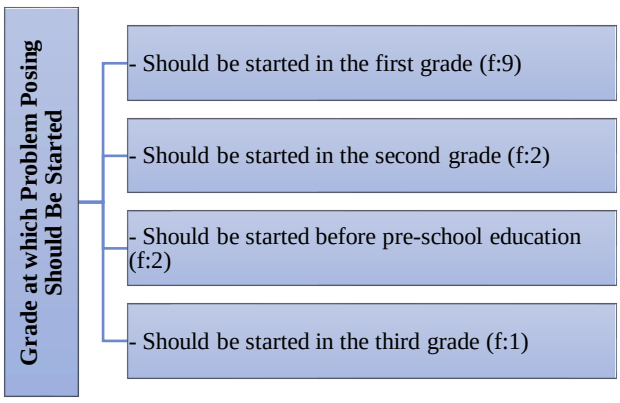

Figure 9. The grade at which problem posing should be started

Regarding the problem posing skill levels of students, five of the teachers stated that their level was good, four of them stated that their level was moderate, two of them stated that their level was very good, and one of them stated that their level was low. These codes are presented in Figure 10. Two teachers did not indicate a clear level. While PT10 stated that the problem posing skill of students was at a very good level by saying that *"I mean, in terms of my own class, I mean mathematics, problem posing does not fall below 90%.", PT12 stated that their level was good by stating that "Who can do things like this, 70% within the problem."*

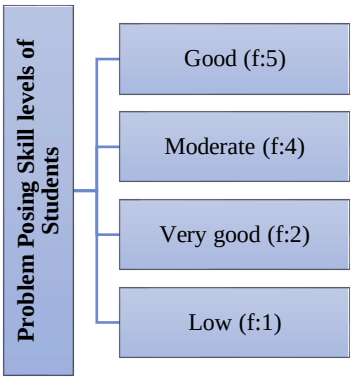

Figure 10. The problem posing skill levels of students

Two sub-themes consisting of the prerequisites for linguistic skills and the prerequisites for cognitive and affective domains were created within the scope of the prerequisites for students to be able to pose a problem. The sub-themes and codes for this theme are presented in Figure 11. The codes of reading many books (f:4), the richness of vocabulary (f:2), reading comprehension skills (f:2) and written and oral expression skills (f:1) are included within the scope of the sub-theme of the prerequisites for linguistic skills. For this sub-theme, while PT8 said that *"However, the others, for example, let's say those who read more books and whose families speak more, a child with a richer vocabulary can pose a problem better."*, PT9 expressed that *"Because I have some students who are very intelligent, their mathematical intelligence is quite dominant, however, when I say let's pose a problem, the child cannot use his imagination. Indeed, he also reads books; I have a very good student, he also reads books, I am sure that his vocabulary is also rich, however, when the child is going to imagine something, he cannot imagine, he has difficulty. I have some students who will certainly hear something from someone, will be affected from there and imagine."* The codes of imagination (f:2), having understood the subject (f:1), and the interest and ability towards the course (f:1) are included within the scope of the sub-theme of the prerequisites for cognitive and affective domains.

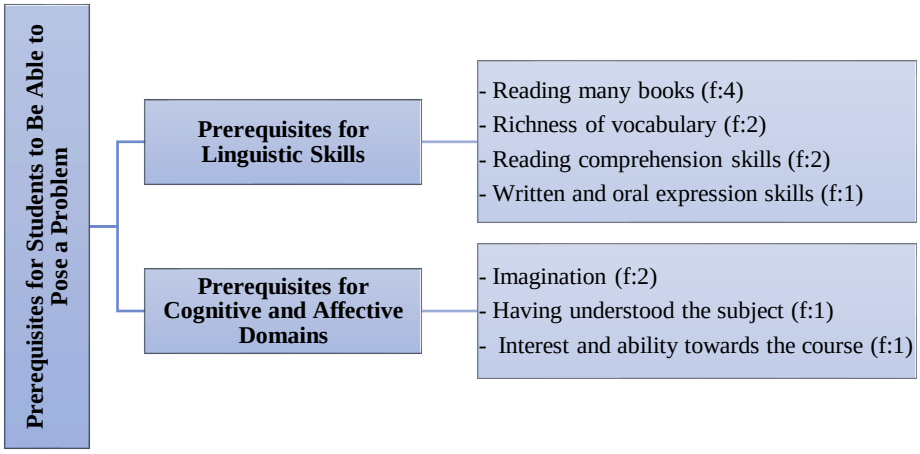

Figure 11. The prerequisites for students to be able to pose a problem

Within the scope of the theme of the problem posing activities in textbooks, three sub-themes were created as positive opinions, negative opinions and the form of being included in books. The sub-themes and codes for this theme are presented in Figure 12. Within the scope of positive opinions, few teachers stated that they found problem posing activities in textbooks qualified enough (f:3) while most of the teachers had negative opinions about it. Within the scope of the sub-theme of negative opinions, teachers mostly stated that they did not find problem posing activities in textbooks adequate (f:7) and that problem posing activities were few in number (f:6). However, the codes of inconsistent content and evaluation (f:2), failure to ensure the activity-time balance (f:2), being very simple (f:2), no space allocated for problem posing (f:1), the use of unknown terms (f:1), and nonfunctionality (f:1) are also included within the scope of this sub-theme. For this sub-theme, PT10 emphasized that the number of problem posing activities was small by stating that *"Well, I think there is only the lack of problem posing."* The codes of including semi-structured problem posing (f:3), including in certain units (f:1), including after problem solving activities (f:1), and including at the end of the subject (f:1) are included within the scope of the sub-theme of the form of being included in books. For this sub-theme, PT2 expressed his opinions by stating that *"The units are certain, they are in certain units. The problem, well, they make us solve the problem at*

first. They give normal problems, we read them, we solve them, we write them, whatsoever. Then, for example, they give some data and ask us to pose one of them according to these data, we perform as much as this."

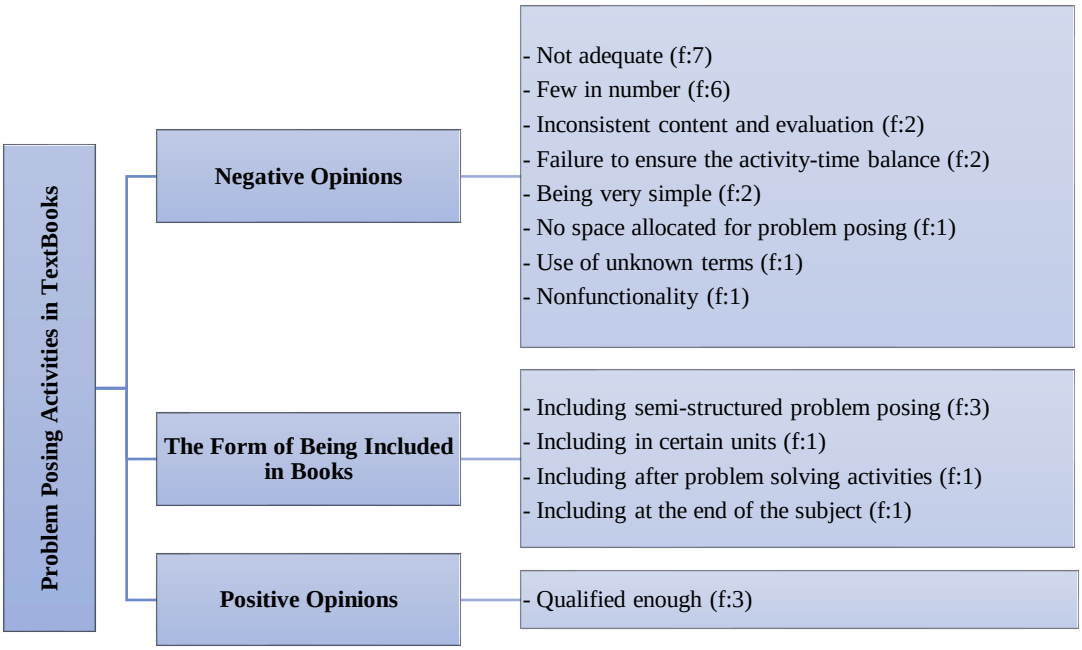

Figure 12. The problem posing activities in textbooks

Two sub-themes consisting of cognitive problems and affective problems were created within the scope of the theme of the problems related to problem posing. The sub-themes and codes for this theme are presented in Figure 13. Within the scope of cognitive problems, teachers mostly expressed the problems related to posing short and simple problems (f:3), failure to pose a free problem (f:3) and having difficulty in language and expression (f:3). However, there are also problems related to having difficulty in organizing the problem (f:2), failure in self-expression (f:2), having difficulty in starting the problem (f:1) and failure to pose a problem by understanding (f:1). For this sub-theme, PT9 expressed her opinions about the problem of posing simple and short problems by stating that *"If there are a few numbers and addition is required, they ask us to add all of them and finish it, they do not make you extend the narration."* Within the scope of the sub-theme of affective problems, teachers mentioned the problems of unwillingness to pose a free problem (f:1), being reluctant to pose a problem (f:1), being prejudiced against posing a problem (f:1) and failure to dream (f:1). For this sub-theme, PT11 emphasized the prejudice against problem posing by stating that *"At first, as I have already mentioned, they think they cannot do it. I mean, they do not even try to do it by thinking that it is very difficult and how to do it. If I do not make it obligatory, they mostly do not do it; but they do it if I make it obligatory, and then they realize it by themselves."*

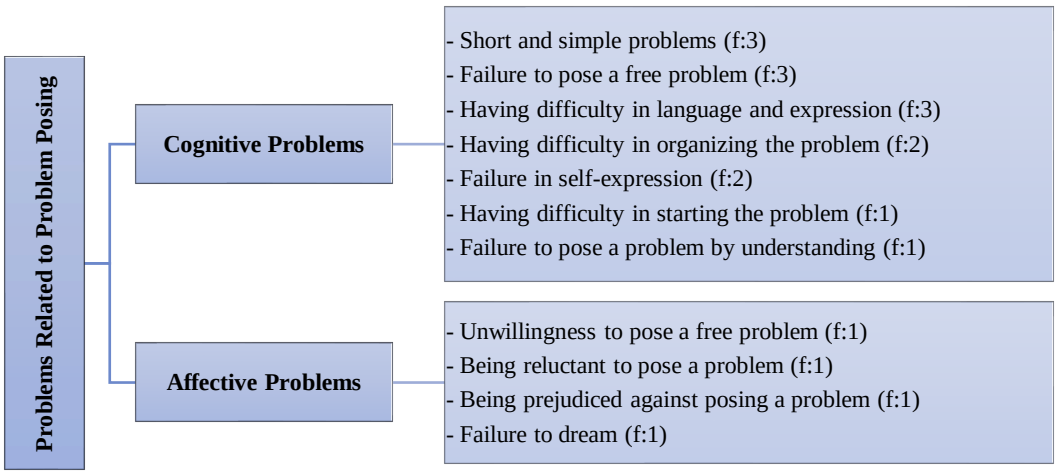

Figure 13. The problems related to problem posing

Three themes consisting of the sources related to students, the sources related to curriculum and teacher, and the sources related to the system were created in the theme of the sources of problems related to problem posing. The

sub-themes and codes for this theme are presented in Figure 14. Within the scope of the sub-theme of the sources related to students, there are the codes of the lack of self-confidence (f:2), the lack of reading and the lack of a rich vocabulary (f:2), different student perception levels (f:2), the lack of reading comprehension (f:2), failure to look from a broad perspective (f:1), having learning difficulties (f:1), the lack of four-operation skill (f:1), the fact that students have not grasped the subject (f:1), expecting data from the teacher (f:1), deficiencies in basic knowledge and skills (f:1), failure to follow instructions (f:1), failure to study adequately (f:1), different mother tongue (f:1), not understanding the subject (f:1), failure to think and make reasoning (f:1), failure to make correct sentences and use correct data (f:1), failure to listen to the teacher effectively (f:1), and not liking to write (f:1). Within the scope of this sub-theme, PT14 referred to different sources related to students by indicating that *"I attribute it to the thing, you know, as I have just said, I'm always talking about this, because they do not read more books, I mean they have no word memories. They cannot take something forward, they bring to an end in a certain place, they do not look at it from a broad perspective, so they get stuck."* Within the scope of the sub-theme of the sources related to curriculum and teacher, teachers mostly referred to the effort to complete the curriculum and the lack of time (f:4). However, the codes of the fact that the curriculum and teachers do not focus on it adequately (f:2), teachers' lack of knowledge of new methods (f:1), errors in the ordering of subjects (f:1), being a new practice (f:1), considering problem solving more important (f:1) are included within the scope of this sub-theme. For this sub-theme, PT8 expressed his opinions by stating that *"I mean, actually, this is a great deficiency of us, teachers, I think it is also the deficiency of mathematics textbooks, the deficiency of the curriculum, you know, they are included in the curriculum. As I have said, they are certainly included in our curriculum, but I think they are not focused on sufficiently, also by us as teachers."* The codes of starting school at an early age (f:2), continuous changes of teachers (f:1), being deprived of family education and pre-school education (f:1) and the large classroom size (f:1) are included within the scope of the sub-theme of the sources related to the system. For this sub-theme, PT3 mentioned that he considered starting school at an earlier age than it should be as a source of problems by stating that *"As I have said, they come from the age group of 5, they cannot express themselves yet, they cannot understand what they read."*

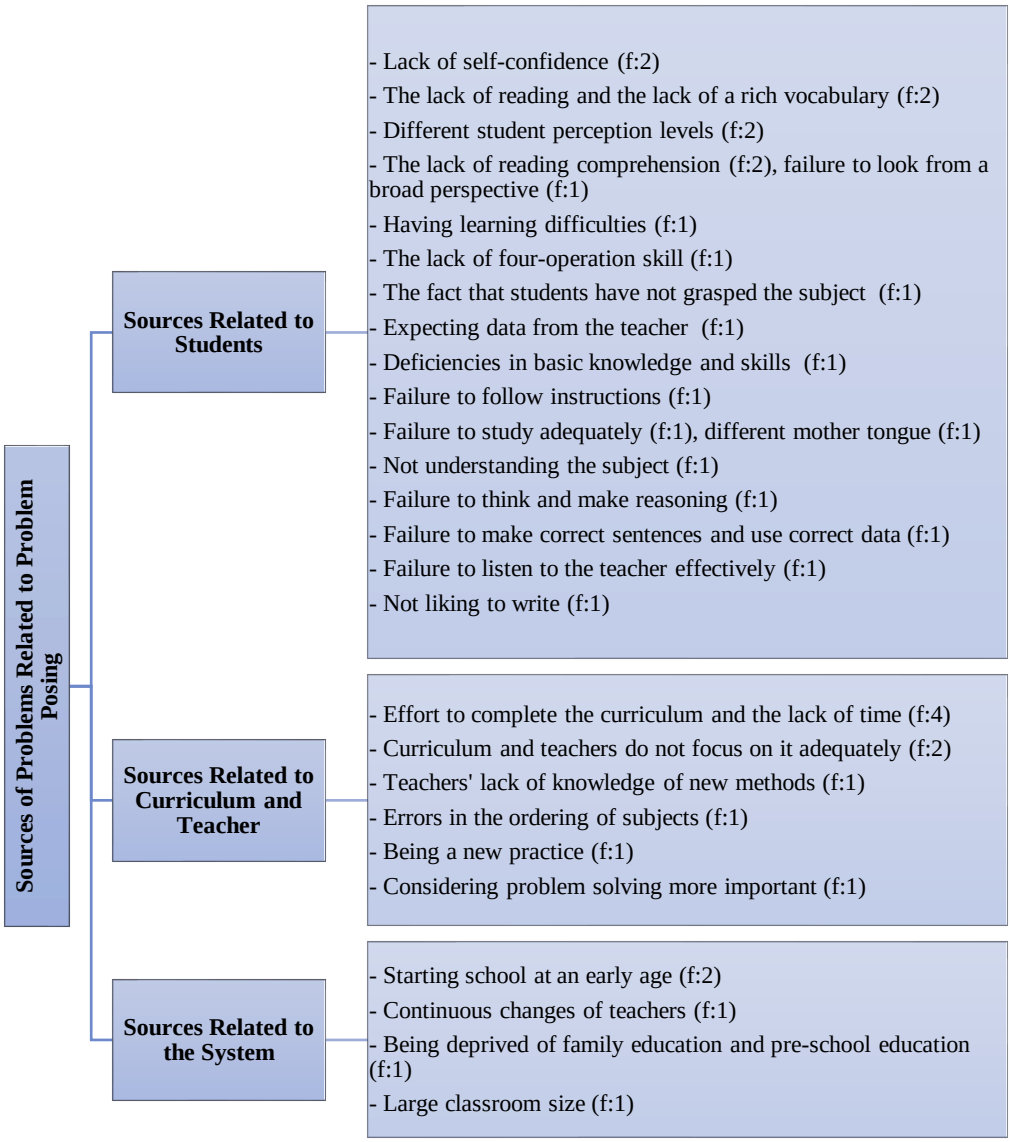

Figure 14. The sources of problems related to problem posing

Four sub-themes consisting of proposals for teaching, proposals for the curriculum, books and teachers, proposals for the affective domain, and proposals for skills were created within the scope of the theme of the solution proposals for the improvement and problems. The sub-themes and codes for this theme are presented in Figure 15. Within the scope of the sub-theme of the proposals for teaching, the proposals for increasing the number of examples and including them more frequently (f: 8) were mostly suggested. However, within the scope of this sub-theme, the proposals for giving examples, work sheets and activities appropriate to their level (f:4), ensuring learning through practicing and experience (f:3), repeating the subject and doing practice on the subject (f:2), adding visuality (f:1), giving homework (f:1), posing problems after the subject is fully learned (f:1) and ensuring that the student understands the subject by taking care of the student personally (f:1) were also generated. For this sub-theme, PT7 suggested that problem posing should be included more frequently by stating that *"I mean, it is something that can be done, it is necessary to do this as often as possible. The more you do it, the sooner the child gets used to it. The mindset is shaped accordingly. So, what can be done is to do it frequently. I mean, it should be performed frequently."* Within the scope of the sub-theme of the proposals for the curriculum, books and teachers, the proposals for providing teachers with family support and assistance in problem posing (f:4), including problem posing more in textbooks (f:3), organizing in-service training on problem posing (f:2), making arrangements for the lack of time (f:2), spreading problem solving and posing activities over the whole year (f:1), reflecting them in curricula and making arrangements related to problem posing in curricula (f:1), allocating more time to problem posing (f:1), including teachers in the curriculum development process (f:1), including them at the beginning of the subject, not at the end of the subject (f:1), placing it in the essence of the course (f:1) and giving teachers supplementary books related to the method (f:1) were generated. Within the scope of the theme of the proposals

for the affective domain, the proposals of ensuring that they like the course and ensuring their interest (f:2), developing imagination (f:2), encouraging students to pose a problem (f:2), ensuring that the student needs it (f:1) and empathizing with students (f:1) were suggested. Finally, within the sub-theme of the proposals for skills, the proposals of developing reading and reading comprehension skills (f:4) and following the instructions and gaining the analytical thinking skill (f:1) were generated.

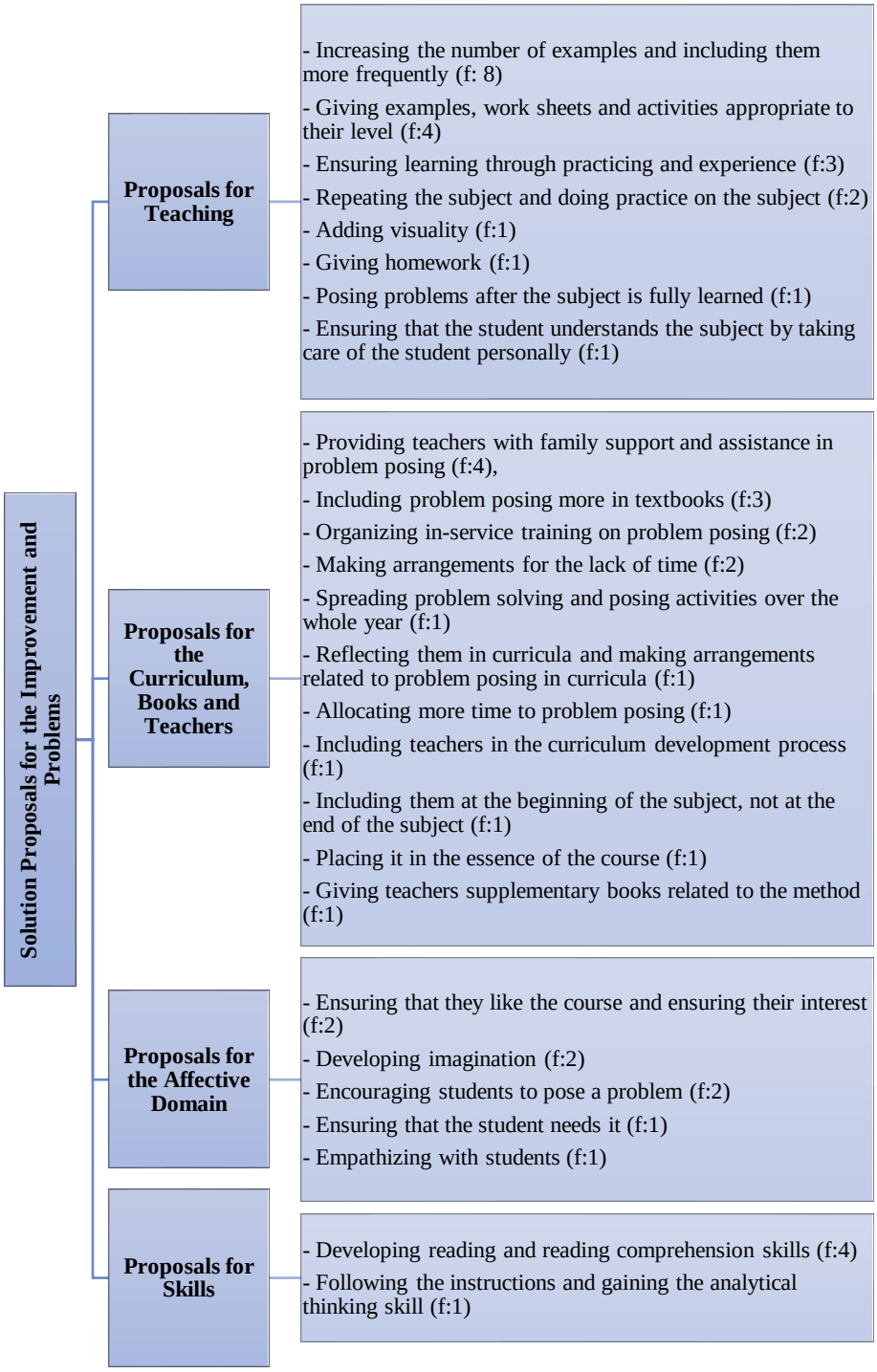

Figure 15. The solution proposals for the improvement and problems

4. DISCUSSION AND RESULTS

As a result of the study, it was determined that most of the teachers usually included problem posing activities at the end of each subject. Besides, it was also determined that most of the teachers included problem posing activities while some teachers included problem posing activities less often. Arıkan and Ünal (2014) mention that some teachers prefer to include problem solving activities instead of problem posing studies, however, this situation

causes a deficiency for the students. Aydoğdu-İskenderoğlu and Güneş (2016) also stated that teachers included problem solving activities rather than problem posing activities. Accordingly, Contreras (2013) suggests that teachers should provide opportunities to the students to experience posing mathematical problems. When the positive effects of problem posing are considered, the fact that teachers do not include problem posing adequately is a significant deficiency in terms of students. Furthermore, within the scope of the activities performed for problem posing, it has been determined that the majority of teachers have included semi-structured problem posing activities, however, the structured problem posing and free problem posing approaches have been relatively less often included, and the approach of creating problem stories has been slightly included. Accordingly, considering the importance of performing activities for all approaches in order to improve students' problem posing skills, it is necessary for teachers to use different approaches and activities for problem posing.

Teachers have indicated that problem posing has many positive effects in mathematical, cognitive, affective and reflections on life dimensions. In the studies carried out accordingly, it is stated that problem posing activities increase mathematical comprehension and academic achievement (Solórzano, 2015), improve problem solving skills (Silver, 2013), improve thinking about reinforcing mathematical concepts (Kwek 2015), contribute to creative and critical thinking (Arıkan & Ünal, 2014) and positively affect the attitude towards problem posing (Chen et al., 2015) and the opinions towards the mathematics course (Turhan & Güven, 2014). In this context, it is observed that problem posing activities make several contributions to students explicitly or implicitly.

Within the scope of the relationship between problem posing and problem solving, some teachers established relationships in terms of being a prerequisite while some teachers stated that there were differences in terms of qualification. Under this theme, teachers generally stated that students who can pose problems are successful in problem solving. In this regard, Kojima et al. (2015) also state that problem posing is a necessary skill to solve problems in daily life. Besides, it is also mentioned that performing problem posing activities contributes to the development of strategies for problem solving (Cai & Hwang, 2003). Based on this, it can be said that there is a close relationship between problem posing and problem solving and that students with the problem posing skill are more successful in problem solving.

Within the scope of the qualifications that teachers should have for the teaching of problem posing, it was determined that qualifications for the subject area, personal qualifications, qualifications for classroom management, qualifications for the affective domain, and qualifications for being planned and prepared were addressed. Within the scope of these themes, it was observed that qualifications for the subject area were mostly indicated. According to Tertemiz and Sulak (2013), teachers need to gain some competencies to adopt the approaches on problem posing and to apply them in the classroom. According to Katrancı and Şengül (2015), teachers should have a deep understanding of problem posing activities. It was determined that all of the teachers participating in the study were not trained on problem posing and performed problem posing activities with their own efforts and experiences. Furthermore, some of the teachers stated that they did not consider themselves adequate in teaching of problem posing. In order to gain problem posing skills to students effectively, most of the teachers stated that they partially believed in it or did not believe in it at all. Only three of the teachers thought that they gained the problem posing skill effectively. When it is considered that changing the opinions and beliefs of teachers is a prerequisite to change students' thoughts and attitudes in relation to mathematics (Bonotto, 2010), to develop students' knowledge and skills for problem posing, teachers should have positive beliefs about providing these knowledge and skills. In this context, Çıldır and Sezen (2011) also state that it is a fundamental responsibility for teachers to organize the necessary environment and to give students the necessary preliminary information for problem posing activities. Accordingly, in order to improve students' problem posing skills, first of all, teachers' knowledge, skills and values should be developed to effectively gain problem posing skills. Regarding this situation, Lavy and Shriki (2010) indicate that mathematical problem posing education should be included in teacher education programs.

It was determined that teachers considered different criteria to evaluate the problems posed. Moreover, it was determined that half of the teachers performed individual feedback-correction. A teacher stated that he/she could not evaluate the problems posed. In this context, Kwek (2015) stated that problem posing could provide information to teachers on the learning deficiencies of students, and Kılıç (2013b) stated that it could be used in determining students' mathematical errors and misunderstandings. Besides, the control and evaluation of the problems posed is an important dimension of problem posing activities, and it becomes difficult to determine whether problem posing activities have been achieved without evaluating the problems posed by students. Accordingly, it is important for teachers to give feedback and correction to the problems posed by students in problem posing activities. Within the scope of the criteria considered in the evaluation, it was determined that teachers mostly considered the criteria such as including what is desired, language and expression, the solution of the problem posed, the number of operations used, being original and different, and being related to the subject. In the studies conducted to evaluate the problem posing skill, it was determined that different criteria such as solvability, language and expression, information included in the problem, the number of operations required for

the solution, posing a problem in the desired direction, reaching a solution, originality, complexity, and the amount of data were considered (Silver & Cai, 1996; Grundmeier, 2003; Gülten et al., 2007; Turhan & Güven, 2014; Arıkan & Ünal, 2015; Yıldız & Özdemir, 2015). Accordingly, it is thought that the criteria that teachers consider in evaluating the problems posed have similar qualities with the criteria used in the studies included in the literature.

Within the scope of the grade at which problem posing activities should be started, most of the teachers stated that problem posing activities should be addressed in the first grade on the basis of different reasons. In this regard, in the mathematics curriculum that was put into practice in the 2017-2018 academic year, it is also stated that problem posing activities will be started in the first grade (MNE, 2017). It can be said that the implementation of the opinions presented by teachers in this regard in the current curriculum is an important step to fill the deficiency in this regard.

Within the scope of the students' problem posing skill levels, while half of the teachers considered their level to be good and very good, four teachers stated that their level was moderate. A teacher stated that their level was low. In the studies carried out at the primary school level within the context of Turkey, it has been determined that students' problem posing skills are not at a sufficient level (Arıkan & Ünal, 2013; Gökkurt et al., 2015) and that they can pose problems for some dimensions while they have difficulties in posing suitable problems for other dimensions (Tertemiz & Sulak, 2013). Accordingly, it can be said that some students are at a sufficient level in terms of the problem posing skill while the problem posing skill levels of some students are not sufficient and some students have problems.

It is considered important to identify the problems faced by teachers with regard to problem posing activities in order to help solve the problems and for teachers to be more effective (Kılıç, 2012). Within the scope of the problems related to problem posing, problems were addressed in two dimensions as cognitive and affective. Within the scope of the source of these problems, teachers mostly stated that problems resulted from students, they also addressed the problems resulting from the curriculum and the teacher and the system. Within the scope of the solution proposals for these problems, they mostly suggested proposals for teaching, and proposals for the curriculum, books and teachers, and they also suggested proposals for the affective domain and skills. When the literature on problem posing is examined, it is stated that students have difficulty in forming mathematical structures for problem posing (Kojima et al., 2015), they have difficulty in finding the path to follow for problem posing (Cai & Hwang, 2002), students have difficulty in posing suitable problems (Van Harpen & Presmeg, 2013), they cannot use the language well while posing a problem (Arıkan & Ünal, 2013). There are even studies revealing that teachers and preservice teachers also have difficulties in problem posing (Kılıç, 2013a; Kılıç, 2013b; Kar & Işık, 2015; Yıldız & Özdemir, 2015).

Within the scope of problem posing activities in the textbooks, mostly negative opinions were presented. Accordingly, most of the teachers do not consider problem posing activities in the textbooks adequate. The current situation and positive opinions on textbooks were also mentioned. Işık and Kar (2012) state that textbooks include problem posing situations for open-ended verbal stories, given operations, figures, pictures and graphics. In this regard, Kılıç (2011) suggests that mathematics textbooks can be examined in terms of problem posing activities. In this context, it can be said that it will be useful to examine problem posing activities in mathematics textbooks in terms of level, content and competence.

Within the scope of prerequisites for students to pose problems, it was stated that prerequisites for linguistic skills and prerequisites for cognitive and affective domains should be ensured. Regarding this issue, it is stated that the cognitive skills required for problem posing and problem solving may vary in various situations and that generating new and creative problems for problem situations may sometimes be more difficult than generating solutions to problems (Kojima, Miwa & Matsui, 2015). In the context of creative problem posing, it is considered necessary to have cognitive skills related to fluency, flexibility and innovation (Siswono, 2010). Besides, students should use the language well to be able to pose a problem (Arıkan & Ünal, 2013). It is also stated that both cognitive and affective requirements are needed for problem posing activities (Kılıç 2012). In this context, teachers' opinions about the prerequisite qualifications for problem posing are also mentioned in the studies in the literature.

In line with the results of the study, some suggestions were made for the implementations and studies to be carried out in the future. Teachers can be encouraged to include more problem posing activities, and preservice and inservice training for the teaching of problem posing can be organized. Arrangements can be made for different problem posing strategies instead of including a certain problem posing strategy in the curricula, textbooks and classroom practices. The problems posed by students can be evaluated more effectively and objectively, and sample forms and evaluation methods can be presented to teachers for evaluation. Problem posing activities can be performed as of the primary school first grade by organizing them according to levels. Problem posing activities included in textbooks can be revised and improved. Various activities can be performed for the vocabulary and

reading comprehension skills of students by developing their reading habits. More detailed results can be obtained by collecting data through observations to examine the current situation at schools for problem posing.

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GENİŞ ÖZET

1. Araştırmanın Amacı

Araştırmanın genel amacı, sınıf öğretmenlerinin matematik dersi kapsamında problem kurma becerisi kazandırmaya yönelik görüşlerinin belirlenmesidir.

2. Yöntem

Araştırmada, nitel araştırma desenlerinden olgu bilim deseni kullanılmıştır. Bu araştırmada da matematik dersinde problem kurma çalışmaları yapan sınıf öğretmenlerinin, problem kurma becerisi kazandırmaya yönelik deneyimlerinden yola çıkılarak görüşleri anlaşılmaya çalışılmıştır. Araştırmanın katılımcılarının belirlenmesinde amaçlı örnekleme yöntemlerinden ölçüt örnekleme yöntemi göz önünde bulundurulmuştur. Ölçüt örneklemede göz önünde bulundurulan ölçütler; katılımcıların üçüncü ve dördüncü düzeyde sınıf öğretmenliği yapıyor olmaları ve matematik dersinde problem kurma etkinliklerine yer vermeleri olarak belirlenmiştir. Araştırmanın katılımcılarını, ilkokulda farklı sınıf düzeylerinde Adana ili Çukurova ve Yüreğir ilçelerinde görev yapmakta olan on dört sınıf öğretmeni oluşturmaktadır. Araştırma verilerinin toplanmasında yarı yapılandırılmış görüşme tekniği çerçevesinde, araştırmacılar tarafından hazırlanan ve on beş sorudan oluşan görüşme formu kullanılmıştır. NVIVO10 programıyla verilerin analiz edildiği araştırmada, veri analiz tekniği olarak içerik analizi kullanılmıştır. İçerik analizi çerçevesinde, görüşmelerin yazılı dökümleri kodlanmış, ilişkili kodlar bir araya getirilerek temalar oluşturulmuştur. Veri analizine yönelik geçerlik ve güvenirlik çalışmaları kapsamında ise bir araştırmacı tarafından gerçekleştirilen içerik analizinde ortaya çıkan kod ve temalar diğer araştırmacı tarafından incelenmiş ve kodlar ve temaların tutarlılığına ve uygunluğuna yönelik uzman görüşü alınmıştır.

3. Tartışma ve Sonuç

Araştırmanın sonucunda, öğretmenlerin çoğunun genellikle her konunun sonunda problem kurma çalışmalarına yer verdikleri belirlenmiştir. Bununla birlikte, öğretmenlerin çoğunun problem kurma çalışmalarına yer verirken, bazı öğretmenlerin problem kurma çalışmalarına az yer verdikleri belirlenmiştir. Arıkan ve Ünal (2014) bazı öğretmenlerin bir problem kurma çalışması yapmak yerine problem çözme çalışmalarına yer vermeyi tercih ettiklerini fakat bu durumun öğrenciler açısından eksiklik taşıdığını dile getirmektedir. Yine Aydoğdu-İskenderoğlu ve Güneş (2016) de öğretmenlerin problem kurma çalışmalarından çok problem çözme etkinliklerine yer verdiklerini belirtmişlerdir. Bu doğrultuda, Contreras (2013) ise öğretmenlerin öğrencilere matematiksel problem kurmaya yönelik deneyimler sağlamalarını önermektedir. Problem kurmanın olumlu etkileri göz önüne alındığında, öğretmenlerin problem kurmaya yeterince yer vermemelerinin öğrenciler açısından önemli bir eksiklik olduğu söylenebilir. Ayrıca, problem kurmaya yönelik gerçekleştirilen etkinlikler kapsamında, öğretmenlerin çoğunun yarı-yapılandırılmış problem kurma çalışmalarına yer verdikleri, bununla birlikte yapılandırılmış problem kurma ve serbest problem kurma yaklaşımlarına nispeten daha az yer verildiği, problem hikâyeleri oluşturma yaklaşımına ise çok az yer verildiği belirlenmiştir. Bu doğrultuda, öğrencilerin problem kurma becerilerini geliştirmek için tüm yaklaşımlara yönelik etkinlikler yapılmasının önemi göz önüne alındığında, öğretmenlerin problem kurmaya yönelik olarak farklı yaklaşım ve etkinlikleri kullanmaları gerekli görülmektedir.

Öğretmenler, matematiksel, bilişsel, duyuşsal ve yaşama yansımaları boyutlarında problem kurmanın pek çok olumlu etkisinin olduğunu belirtmişlerdir. Problem kurmaya yönelik çalışmalarda da problem kurmanın pek çok katkısının olduğu belirtilmektedir (Arıkan & Ünal, 2014; Kwek, 2015; Silver, 2013; Solórzano, 2015; Turhan & Güven, 2014). Problem kurma ile problem çözme arasındaki ilişki kapsamında bazı öğretmenler, önkoşul olma açısından ilişkiler kurarken bazı öğretmenler ise nitelik açısından farklılıklar bulunduğunu belirtmişlerdir. Bu tema altında öğretmenler genellikle, problem kurabilen öğrencilerin problem çözmede başarılı olduklarını belirtmişlerdir. Bu duruma yönelik olarak, Kojima vd. (2015) de problem kurmanın günlük yaşamda problem çözebilmek için gerekli bir beceri olduğunu belirtmektedirler. Bununla birlikte, problem kurma çalışmaları yapmanın problem çözmeye yönelik stratejiler geliştirmeye katkıda bulunduğu da dile getirilmektedir (Cai & Hwang, 2003). Buradan yola çıkılarak, problem kurma ile problem çözme arasında sıkı bir ilişki olduğu, problem kurma becerisine sahip öğrencilerin problem çözme konusunda daha başarılı oldukları söylenebilir.

Öğretmenin problem kurma öğretimine yönelik sahip olması gereken nitelikler kapsamında, konu alanına yönelik nitelikler, kişisel nitelikler, sınıf yönetimine yönelik nitelikler, duyuşsal alana yönelik nitelikler, planlı ve hazırlıklı olmaya yönelik niteliklerin ele alındığı belirlenmiştir. Söz konusu temalar kapsamında daha çok konu alanına yönelik niteliklerin belirtildiği görülmüştür. Tertemiz ve Sulak'a (2013) göre, öğretmenlerin problem kurma konusundaki yaklaşımları benimsemeleri ve bunları sınıfta uygulamaları için bazı yeterlilikler kazanmaları gereklidir. Katrancı ve Şengül'e (2015) göre de öğretmenlerin, problem kurma etkinliklerine yönelik derin bir

anlama sahip olmaları gereklidir. Araştırmaya katılan öğretmenlerin tamamının problem kurmaya yönelik eğitim almadıkları, kendi çaba ve deneyimleriyle problem kurma çalışmaları yaptıkları belirlenmiştir. Ayrıca, öğretmenlerin bir kısmı problem kurma öğretimi konusunda kendilerini yeterli görmediklerini belirtmişlerdir. Problem kurma becerisini etkili bir şekilde kazandırma durumuna yönelik olarak, öğretmenlerin çoğu kısmen veya hiç inanmadıklarını belirtmişlerdir. Öğretmenlerden sadece üçü etkili bir şekilde problem kurma becerisi kazandırdığını düşünmektedir. Öğrencilerin matematik hakkındaki düşünce ve tutumlarını değiştirmek için öğretmenlerin görüş ve inançlarını değiştirmenin önkoşul olduğu düşünülürse (Bonotto, 2010) öğrencilerin problem kurmaya yönelik bilgi ve becerilerini geliştirmek için öğretmenlerin bu bilgi ve becerileri kazandırmaya yönelik inançlarının olması gerekmektedir. Bu bağlamda Çıldır ve Sezen (2011) de problem kurma etkinlikleri için öğretmenlerin gerekli ortamı düzenlemesi ve öğrencilere gerekli önbilgiyi vermesinin temel bir sorumluluk olduğunu belirtmektedirler. Bu doğrultuda, öğrencilerin problem kurma becerisini geliştirmek için öncelikle öğretmenlerin problem kurma becerisini etkili bir şekilde kazandırmaya yönelik bilgi, beceri ve değerleri geliştirilmelidir. Bu duruma yönelik olarak Lavy ve Shriki (2010), öğretmen eğitimi programlarında matematiksel problem kurma eğitimine yer verilmesi gerektiğini belirtmektedirler.

Kurulan problemleri değerlendirmek için öğretmenlerin farklı ölçütleri göz önünde bulundurdukları belirlenmiştir. Bunun yanında, öğretmenlerin yarısının bireysel dönüt-düzeltme yaptıkları belirlenmiştir. Bir öğretmen ise kurulan problemleri değerlendiremediğini belirtmiştir. Bu bağlamda Kwek (2015), problem kurma çalışmalarının, öğrencilerin öğrenme eksikliklerine yönelik öğretmenlere bilgi sağlayabileceğini; Kılıç (2013b) ise öğrencilerin matematiksel hata ve yanlış anlamalarını belirlemede kullanılabileceğini belirtmiştir. Bununla birlikte, kurulan problemlerin kontrolü ve değerlendirmesi problem kurma çalışmalarının önemli bir boyutudur, öğrencilerin kurdukları problemler değerlendirilmeden problem kurma çalışmalarının amacına ulaşılıp ulaşılmadığının belirlenmesi güçleşir. Bu doğrultuda, problem kurma çalışmalarında öğrencilerin kurdukları problemlere öğretmenler tarafından dönüt ve düzeltme verilmesi önem taşımaktadır. Değerlendirmede göz önünde bulundurulan ölçütler kapsamında ise öğretmenler en çok istenilenlere yer verme, dil ve anlatım, kurulan problemin çözümü, kullanılan işlem sayısı, özgün ve farklı olma, konuyla ilgili olma gibi ölçütleri dikkate aldıklarını belirtmişlerdir. Problem kurma becerisini değerlendirmeye yönelik gerçekleştirilen çalışmalarda, çözülebilirlik, dil ve anlatım, problemin içerdiği bilgi, çözüm için gereken işlem sayısı, istenilen yönde problem kurma, çözüme ulaşma, özgünlük, karmaşıklık, veri miktarı gibi farklı ölçütlerin göz önünde bulundurulduğu belirlenmiştir (Arıkan & Ünal, 2015; Grundmeier, 2003; Gülten vd., 2007; Turhan & Güven, 2014; Silver & Cai, 1996; Yıldız & Özdemir, 2015). Bu doğrultuda, öğretmenlerin kurulan problemleri değerlendirmede göz önünde bulundurdukları ölçütlerin, alan yazında yer alan çalışmalarda kullanılan ölçütlerle benzer nitelikler taşıdığı düşünülmektedir.

Problem kurma çalışmalarına başlanması gereken düzey kapsamında, öğretmenlerin büyük çoğunluğu farklı nedenler çerçevesinde birinci sınıfta ele alınması gerektiğini belirtmişlerdir. Bu konuda, 2017-2018 eğitim-öğretim yılında uygulamaya konulan Matematik Dersi Öğretim Programı'nda da birinci sınıfta problem kurma çalışmalarına başlanacağı belirtilmektedir (Millî Eğitim Bakanlığı, 2017). Öğretmenlerin bu konuda sundukları görüşlerin, mevcut öğretim programında uygulanmasının da bu konudaki eksikliği gidermek için önemli bir adım olduğu söylenebilir.

Öğrencilerin problem kurma düzeyleri kapsamında, öğretmenlerin yarısı iyi ve çok iyi olarak görürken, dört öğretmen orta düzeyde olduğunu belirtmiştir. Bir öğretmen düşük düzeyde olduğunu belirtmiştir. Türkiye bağlamında, ilkokul düzeyinde yapılan çalışmalarda, öğrencilerin problem kurma becerilerinin yeterli düzeyde olmadığı (Arıkan & Ünal, 2013; Gökkurt vd., 2015) ve bazı boyutlara yönelik problem kurabilirken, bazı boyutlara yönelik uygun problem kurmada güçlükler yaşadıkları (Tertemiz & Sulak, 2013) belirlenmiştir. Bu doğrultuda, bazı öğrenciler problem kurma becerisi açısından yeterli düzeydeyken, bazı öğrencilerin problem kurma beceri düzeylerinin yeterli olmadığı ve sorun yaşadıkları söylenebilir.

Sorunları çözmeye yardımcı olması ve öğretmenlerin daha etkili olabilmesi için problem kurma faaliyetleriyle ilgili olarak öğretmenlerin karşılaştıkları sorunların belirlenmesi önemli görülmektedir (Kılıç, 2012). Problem kurmaya yönelik yaşanan sorunlar bilişsel ve duyuşsal olarak iki boyutta ele alınmıştır. Bu sorunların kaynağı kapsamında ise öğretmenler daha çok öğrenciden kaynaklı olduğunu belirtmişler, bunun dışında, program ve öğretmenden kaynaklı ve sistemden kaynaklı sorunları da ele almışlardır. Söz konusu bu sorunlara yönelik çözüm önerileri kapsamında ise daha çok işlenişe yönelik ve programa, kitaplara ve öğretmenlere yönelik önerilerde bulunmuşlar, bunun yanında, duyuşsal alana ve becerilere yönelik öneriler de sunmuşlardır. Problem kurmaya yönelik alan yazın incelendiğinde, öğrencilerin problem kurmaya yönelik matematiksel yapıları oluşturmada güçlük çektikleri (Kojima vd., 2015); problem kurmaya yönelik izlemeleri gereken yolu bulmada sorun yaşadıkları (Cai & Hwang, 2002); öğrencilerin uygun problem kurmada zorluk yaşadıkları (Van Harpen & Presmeg, 2013) ve problem kurarken dili iyi kullanamadıkları (Arıkan & Ünal, 2013) belirtilmektedir. Bazı çalışmalarda ise problem kurma konusunda öğretmenlerin ve öğretmen adaylarının da sorun yaşadıkları belirtilmektedir (Kar & Işık, 2015; Kılıç, 2013; Yıldız & Özdemir, 2015).

Ders kitaplarındaki problem kurma etkinlikleri kapsamında, daha çok olumsuz görüşler sunulmuştur. Bu doğrultuda, öğretmenlerin çoğu ders kitaplarındaki problem kurma etkinliklerini yeterli görmemektedirler. Ders kitaplarına yönelik mevcut durum ve olumlu görüşlerden de söz edilmiştir. Işık ve Kar (2012), ders kitaplarında açık uçlu sözel hikâyelere, verilen işlemlere, görsel ve grafiklere yönelik problem kurma durumlarının yer aldığını belirtmişlerdir. Bu konuda Kılıç (2011), matematik ders kitaplarının problem kurma çalışmaları açısından incelenebileceğini önermektedir. Bu bağlamda, ders kitaplarında yer alan problem kurma etkinliklerinin düzey, içerik ve yeterlilik açısından incelenmesinin yararlı olacağı söylenebilir.

Öğrencilerin problem kurabilmesi için önkoşullar kapsamında ise dilsel beceriler ile bilişsel ve duyuşsal alana yönelik koşulların sağlanması gerektiği belirtilmiştir. Bu konuya yönelik olarak, problem çözme ile problem kurma açısından gereken bilişsel becerilerin çeşitli durumlarda değişebildiği, problem durumlarına yönelik yeni ve yaratıcı problemler üretmenin bazı zamanlarda problemlere çözüm üretmekten daha zor olabileceği belirtilmektedir (Kojima vd., 2015). Yaratıcı problem kurma bağlamında ise akıcılık, esneklik ve yenilikle ilgili bilişsel becerilere sahip olmaları gerekli görülmektedir (Siswono, 2010). Bununla birlikte, öğrencilerin problem kurabilmeleri için dili iyi kullanmaları gereklidir (Arıkan & Ünal, 2013). Ayrıca, problem kurma çalışmaları için hem bilişsel hem de duyuşsal açıdan gereksinimlere ihtiyaç duyulduğu belirtilmektedir (Kılıç, 2012). Bu bağlamda, öğretmenlerin problem kurmaya yönelik belirttikleri önkoşul niteliklere yönelik görüşler alan yazındaki çalışmalarda da dile getirilmektedir.

ETİK BEYANNAME

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