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THE REALISTIC REASONS FOR UNREALISTIC SOLUTIONS OF PRE-SERVICE PRIMARY SCHOOL MATHEMATICS TEACHERS IN NON-STANDARD WORD PROBLEMS: THE EXAMPLE FROM TURKEY

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Abstract

Non-standard word problems are very imporatant mathematical problems. Although its importance many people have issues about that kind of problems. In this study it was aimed to find out the reasons of future mathematics teacher students unrealistic solutions in solving non-standard word problems and their suggestions for overcoming this issue. A paper-pencil test consisting of 12 non-standard problems were implemented 126 pre-service primary school mathematics teachers and based on their solutions, after main data collection task-based interviews were conducted with 12 teacher trainees volunteered. According to the findings of the study culture of schooling, interpretation of problem situation, perceptions of problem solving activities, beliefs in mathematics, previous experience and Turkish exam system were found to be the main reasons for not excluding reality while solving non-standard word problems. According to results of the study it can be concluded that the reasons for unrealistic solutions were related problem solving process and not related problem solving process.

Key Words:*Pre-service primary school mathematics teacher, problem solving, nonstandard word problem*

İLKÖĞRETİM MATEMATİK ÖĞRETMENİ ADAYLARININ STANDART OLMAYAN DÖRT İŞLEM PROBLEMLERİNE GERÇEKÇİ OLMAYAN YANITLAR VERMELERİNİN GERÇEKÇİ NEDENLERİ: TÜRKİYE ÖRNEĞİ

Özet

Problem türlerinden önemli bir problem türü de standart olmayan dört işlem problemleridir. Bu türden problemler önemli olmalarına rağmen, pek insan bu türden problemlerin çözümlerinde sorunlar yaşamaktadır. Bu çalışmanın amacı, ilköğretim matematik öğretmeni adaylarının standart olmayan problemlere verdikleri gerçekçi olmayan yanıtların nedenlerini ve yaşanılan soruna yönelik olarak çözüm önerilerini belirlemektir. 126 matematik öğretmen adayına 12 tane standart olmayan dört işlem problemi verilmiş ve bunları çözmeleri istenmiştir. Daha sonra bu öğretmen adayları arasından bu türden problemlere gerçekçi yanıtlar veremeyen 12 gönüllü öğretmen adayı ile de klinik görüşmeler gerçekleştirilmiştir. Araştırmadan elde edilen sonuçlara bakıldığında, okul kültürü, problem durumunu yorumlama, problem çözme etkinlikleri ile ilgili algı, matematiğe olan inanç, önceki deneyim ve Türkiye'deki sınav sistemi gibi nedenlerden dolayı standart olmayan dört işlem problemlerine gerçekçi olmayan yanıtlar verildiği belirlenmiştir. Sonuçlara bakıldığında gerçekçi problem çözememe nedenlerinin doğrudan problem çözme ile ilgili nedenler ve doğrudan problem çözme ile ilgili olmayan nedenler olduğu göze çarpmaktadır.

Anahtar kelimeler: *İlköğretim matematik öğretmen adayı, problem çözme, standart olmayan dört işlem problemi,*

Introduction

Problem solving is the cornerstone of both school mathematics and out of school mathematics. There is a strong emphasis on this subject in many documents (MEB, 2005; NCTM, 2000). In NCTM (2000) it is determined that without the ability to solve problems, the usefulness and power of mathematical ideas, knowledge, and skills are severely limited. In Turkish primary school mathematics curriculum it is recommended that problem solving should be an integral part of mathematics lesson and activities (MEB, 2005). For that reason teaching and learning problem solving skill is an important aspect of mathematics education in all grades of schools in all countries. In the literature it can be seen that there are many different kinds of mathematical problems. Problems can be classified routine *story* and non-routine *process* problems. The word problems are designed to provide follow-up practice in applying previously learned concepts and skills; however, process problems cannot be solved immediately by selecting and applying one or more operations (Souviney, 1994). The solution of process problem solving requires other mathematical skills and concepts.

Word problems are very important for school mathematics. There are many reasons for the importance of this kind of problems. The most important reason for using this type of problem in schools is to train pupils in applying the formal mathematical knowledge and skills learned at school, in real-world situations (Verschaffel, De Corte &Lasure, 1994). According to Wyndhamn and Saljö (1997) word problems constitute an important setting in which children are expected to make proper use of problem solving skills they have acquired in mathematics instruction. Reusser and Stebler (1997) asserted that word problems provide an opportunity to study the interplay among and between language processes, mathematical processes, and situational reasoning and inferencing-between text comprehension, situation comprehension and mathematical problem solving.

When literature examined about word problem it can be seen that this type of problem classified as standard and non-standard problems by researchers (Reuseer & Stebler, 1997; Yoshida, Verschaffel & De Corte ,1997; Olkun and et al., 2009). Standard word problems that could be solved by applying the most obvious arithmetical operation(s) with the given numbers. The problem “A boat sails at a speed of 45km/hr. How long does it take this boat to sail 180 km?” can be given as an example of standard word problem. This problem can be solved by applying arithmetical operation. Non-standard word problems, for which the appropriate mathematical models were less obvious and mathematical modelling assumption was problematic. The problem “One runner’s best time to run 100 meters is 17 sec. How long will take to run 1000 meters?” can be given as an example of non-standard problem. This kind of problem can be solved by using arithmetical operations and it is required to take real life knowledge into account in the problem context (Reuseer & Stebler, 1997; Yoshida, Verschaffel & De Corte, 1997; Olkun et al., 2009). In the literature there is an increasing about importance of non-

standard word problems as well as standard word problems.In the last several decades many researchers focused on pupils' solutions and interpretations of non-standard word problems (Greer, 1993; Verschaffel, De Corte & Lasure, 1994; Yoshida, Verschaffel and De Corte 1997; Reusser and Stebler 1997; Inoue, 2005). A few researches had been conducted about pre-service teachers' solutions and interpretations of non-standard word problems (Verschaffel, De Corte & Borghart, 1997;Artut & Tarım, 2009).

When the literature is scrutinized in terms of non-standard word problems it can be concluded that not only primary, secondary and undergraduate students from different countries often solved that kind of problems ignoring the reality presented in problem context (Öktem, 2009; Greer ,1993; Verschaffel, De Corte & Lasure, 1994; Yoshida, Verschaffel & De Corte, 1997; Reusser & Stebler, 1997; Inoue, 2005), but also pre-service teachers (Verschaffel, De Corte & Borghart, 1997). They showed a strong tendency to exclude realistic considerations from their solutions. This tendency cause unrealistic solutions to occur. This situation is explained by Reusser and Stebler (1997) as;"many students in mathematics lessons "understand" and "solve" mathematical word problems without considering the factual relationship between real-world situations (what the problem texts are about) and mathematical operations".

Inoue (2005) indicated that in solving problems students mindlessly execute arithmetic operations without evaluating their actions in reference to our common sense of understanding of real life practices. Students could apply arithmetical operations correctly but they do not regard these problems as relevant to real life. There are many causes for not taking real life knowledge into consideration in solving non-standard word problems. First cause is stereotyped characteristic of common word problems (Gravemeijer, 1997; Reusser & Stebler, 1997). Second cause is classroom culture (Gravemeijer,1997; Reusser & Stebler, 1997; Hatano, 1997; Wyndhamn & Saljö, 1997;Greer, 1997; Inoue, 2005). As Hatano (1997) states; "unrealistic solutions are products of the mathematics classroom culture, in which students are encouraged much more strongly to find solutions efficiently by using basic arithmetical operations than to find the meaning of the problems or to model the reality described in them". Third cause is that interpretation of problem situation is another factor that produced unrealistic solutions. Individual interpretation of problem situations is important for solving non-standard problems. Students try to make sense of the given problems, or to find the relevance of the given facts to questions they were asked (Hatano, 1997).Fourth reason as Schoenfeld (1991) and Inoue (2005) point out that unrealistic solutions could largely originate in the educational beliefs that students possess about mathematics. In mathematics classrooms, the most popular activity is solving repetitious exercises of algorithmic procedures, rather than making sense of mathematical ideas in terms of students' everyday experience. This may have conditioned students to believe that executing mechanical calculations is more

important than considering the real life meaningfulness of their actions in mathematical activities. Perception about problem solving activities is another reason (Inoue, 2005). Sixth, Gravemeijer (1997) indicated that teacher beliefs are important factor. As Verschaffel et al. (1997) cited that being one of instructional factor that are considered teachers' conceptions and beliefs about the importance of real-world knowledge in arithmetic word problem solving. These are the reasons that found in the literature about unrealistic solution in solving non-standard word problems. It can be said that the more future mathematics teachers are well trained about solving word problems the more their students will be better in solving non-standard word problems. Teachers' conceptions about mathematical problem solving influence their way of teaching with regard to word problem solving (Hong, 1995; Chapman, 2003). Considering teachers' beliefs and conceptions formalize students solving word problems behaviour, it is important to learn the reasons for unrealistic solution of mathematics teacher students about non-standard word problems. In this study it was aimed to investigate the reasons why pre-service primary school mathematics teachers did not give realistic answers to non-standard word problems which require realistic considerations. And what are their suggestions for tackling with this issue.

Method

This study is a qualitative study and main data were obtained from the task-based interviews. Task-based interviews for the study of mathematical behaviour involve minimally a subject and an interviewer, interacting in relation to one or more tasks (questions, problems, or activities) introduced to the subject by the clinican in a pre-planned way (Goldin, 2000).

Participants

A total of 126 mathematics teacher students from Mersin University were applied 12 non-standard word problems and then based on the responses of participants 12 pre-service primary school mathematics teachers were selected to attend the research. For choosing participants creation sampling being one of the qualitative sampling was used. The strategy of this sample is to identify participants who meet the defined criterion (Gay, Mill & Airasian, 2006). These mathematics teacher students were chosen for the study 1) the paper-pencil tests results show that they tend to exclude real life knowledge while solving non-standard word problems. 2) All of them were voluntary. The real names of participants are kept confidential, so the nicknames were given for each. P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8, P_9, P_{10}, P_{11} and P_{12} were used as nickname. The researcher as an interviewer was coded by I.

Data collection

In this study 12 non-standard word problems used as a data collection instrument. Non-standard word problems (tasks) were adapted from study of Verschaffel et al. (1994) and Inoue (2005). Data was collected using paper- pencil

test consisting of 12 non-standard word problems were administered to the 126 participants during one of their class periods. For completing paper-pencil test some statements were given by researcher. The participants completed test approximately in 35 minutes. After the results of the test 12 of the participants were selected for task-based interviews. Any feedback about participants' solutions was not given to participants. To understand why participants ignored reality in non-standard word problems, they were asked to explain the reasons why they gave unrealistic solutions and their interpretations in solving problems during the interviews. Task-based interviews were conducted individually with each participants, it took more or less 20 minutes. All interviews were tape-recorded. And then they were transcripted. The questions were used in task based interviews as *"How did you solve this problem? Could you explain it?", "Why did you think like that?", "You solved problems in this way* (showing their unrealistic solutions)*.What are the reasons for this?", "When you consider this situation what do you suggest? What is your suggestion?"*The non-standard word problems (Verschaffel et al. 1994 and Inoue 2005). that administered in the research as below;

1.1128 students will go to school picnic by bus. Each bus can carry 36 students so how many buses are needed?

2.One runner's best time to run 100 meter is 17 sec. How long will take to run 1000 meter?

3.Tuana has 15 and Kayra has 16 friends. Tuana and Kayra decided to give a party together. They invited all their friends to the party and all of them are present. How many people are there in party?

4.Kagan and Zeynep go to the same school. Kagan lives at a distance of 17 km from the school, Zeynep at 8 km. How far do Kagan and Zeynep live from each other?

5.Grandfather gives his 4 grandchildren a box containing 18 balloons, which they share equally?

6.Yavuz was born in 1978. Now it is 2009. How old is he?

7.A carpenter has bought 10 planks of 2,5 meter each. How many planks of 1 meter can he get out of these planks?

8.A man wants to have a rope long enough to stretch between two poles 12 meter apart, but he has pieces of rope 1,5 meter long. How many of these pieces would be needed to tie together to stretch between the poles?

9.Özlem manually enters data a computer database. It usually takes 1 hour for Özlem to enter 50 data in the database. Özlem has to enter 400 data to the database so how many hours does it take to do?

10. The distance between A and B cities are 180 km. The driver drives 60 km in an hour. The driver starts to drive at 7 AM from A city to B city. So does he arrive at 10 AM B city?

11. What will be the temperature of water in a container if you pour 11 of water at 80^0 and 11 of water 40^0 into it?

12. There are 160 pages of reading assignment. It usually takes 30 minutes to finish 20 pages. If the reading is started at 10 AM, can it be finished by 2 PM?

These problems relating to multiplication, division, addition and subtraction arithmetical operations and requiring take into account the reality presented in the problem context while solving them.

Data analysis

For coding unrealistic written solution Verschaffel et al. (1994) category was used. . In data analysis consisting of three phases classification of Miles and Huberman (1994); data reduction, data display, and conclusion drawing/verification were used. *Data reduction*; refers to the process of selecting, focusing, simplifying, abstracting, and transforming the data that appear in written-up field notes or transcriptions. In this phase researcher coded the data considering important concepts and themes of research problem. *Data display*; a display is an organized, compressed assembly of information that permits conclusion drawing and action. Display can be types of matrices, graphs, charts, and networks. *Conclusion drawing and verification*; emerged concepts, themes and relations are interpreted and compared (Miles and Huberman 1994). In data reduction phase, after the data collected, tape records were transcribed verbatim, researcher read the interview transcript, selected the data and coded them according to the theoretical framework and patterns that emerged in the study. In data display, table was applied for verbal information obtained from participants. In conclusion drawing and verification phase emerged themes were interpreted and compared. And also in this phase quotations of participants opinions were mentioned. To increase the trustworthiness and validity of the study as suggested by Lincoln and Guba (1985) member checks and conformability audit were used. And also the researcher got one colleague' opinions about the code list and research findings.

When participants solution seemed a disposition to exclude real life knowledge in their word problem solving this solution was coded as an unrealistic solution

Results and discussion

Based on the participants unrealistic written solutions and task based interviews revealed that solutions and interpretations were inconsistent with the real world considerations described in the non-standard word problems. Five main codes/reasons were found according to the patterns that emerged in the interviews for unrealistic solutions of pre-service primary school mathematics teachers. Codes/reasons and participants were summarised in Table 1. Participants' beliefs about culture of schooling, interpretation of problem situation, perceptions of problem solving activities, beliefs in mathematics, previous experience and exam

system were found to be reasons for excluding reality while solving non-standard word problems.

Table 1. Reasons of participants unrealistic solutions

Reasons	Participants
Culture of schooling	
Teaching style of teacher	P_2
Interpretation of problem situation	
Looking for extra information	P_1 P_3 P_4 P_5 P_6 P_7 P_8 P_9 P_{10} P_{11}
Focusing on numbers	P_5 P_7
Thinking normally (standard)	P_3 P_4 $P_5$$P_6$ P_8 P_9 P_{10} P_{12}
Perceptions of problem solving activities	
Believing one correct solution	P_1 P_2 P_4 P_{10} P_{12}
Ignoring data	$P_1$$P_4$$P_6$ P_7 P_{10} P_{12}
Focusing on numerical answer	P_3 P_5 P_6 P_7 P_8 P_{10} P_{12}
Not transferring mathematics to real life	P_7 P_9
Beliefs in mathematics	
Mathematics can not be associated real life	P_1
Mathematics is a certain thing	P_6 P_{12}
Previous experience	
No activities regarding reality	P_2
Previous learning style	P_2 P_4 P_5 P_7 P_9 P_{10} P_{11}
Exam system	P_2 P_3 P_4 P_5 P_6 P_7 P_{10} P_{11}

Culture of schooling

One student stated his/her ideas about culture of schooling. Participant P_2 indicated that "*primary school teachers usually solved mathematical problems directly and did not make any comments or any assumptions about solutions."* That student's unrealistic solution reason was his/her teacher's teaching style.

Interpretation of problem situation

Almost all participants stated their ideas about interpretation of problem situation. Ten participants said that extra knowledge is needed when solving these problems. In solving problem 3, participant P_7 and P_{10} asserted that "*do they friends or not, it is not mentioned in the problem*", in problem 6, participant P_9 indicated that "*month is not given so the solution will not change, I guess*". Two participants stated that they focused numbers presented in the problem context rather than real life knowledge. Nine participants declared that they think basic and consider plain logic when solving these type problems. Participant P_5 indicated his/her belief as follow "*I solved the problems directly using information given in problem.* P_8 stated his/her ideas about interpretation of problem situation like *"here I used plain logic but I realized that I solved not correctly"*, P_9 declared his/her ideas *"I thought standard here"* P_{12} mentioned his/her belief "*I do what come to my mind first in problems".* Interpretation of problem situation was another factor that caused unrealistic solutions.

Perceptions of problem solving activities

Almost all participants stated that their ideas about perceptions of problem solving activities. Five participants declared that these are mathematical problems and there should be only one correct solution. Participant P_1 indicated his/her belief like "*if I consider all possibilities I could not solve problems"*. He or she was awareness of the other possibilities of solutions but gave one correct solution. Another example about believing one correct solution as; *P_{10}:I could solve another way but different kind of solutions could be emerged. I:Is it important I mean different solutions? P_{10}: Of course different kind of solutions can be emerged 9 or 15. But it should be clear. Everybody should understand.* P_{10} stated other ways of solutions but performed one correct solution. Six participants ignored data while solving problems. For problem 8 participant P_1 indicated that "*if you do not ignore this situation in the problem, it can not be solved. In physics in some cases you should ignore the data presented in problem, otherwise it can not be solved"*, for problem 3, P_4 indicated his/her opinions like *"it is math so some factors are taken into account unimportant. For that reason I could not say anything"*. For problem 3, P_7 indicated her/his ideas about perceptions of problem solving activities as "*in school activities, there was a statement like did not take into account it in parenthesis. So I did not take into account it"*. As seen from the participants' expressions they believed that ignoring data should be happen while solving that kind of **p**roblems. For problem 8, participant P6 declared his/her ideas about ignoring data as follow; *P6:In here, it is necessary to tie a knot in normal life. But we do not consider them, we join them as if they are cohesive. I:Why do you think like that? P6:In physics, gravity can be voided. It is the same. Knots are voided.*

As happened in some topics of physics participant P6 ignored the reality presented given problems. Seven participants focused on numerical answers while solving problems. P3 indicated his/her opinions as "I have chosen operations I did not consider explanations necessary", P5 declared that "I performed using numbers and find a solution", P7 asserted his/her opinions like "because I tried to find out a solution using numbers, what is the result?", P12 declared his/her ideas "there are numbers you multiple, division, add and at the end a solution is found, it is appeared a solution". Participants believed that finding numerical answers more important than other kind of solutions. Two participants declared that they do not transfer the data to the real life. P7 asserted his/her opinions like "as happened in other problems, I could not consider real life situations", P9 said that "I did not take into account real life situations. I think it is a kind of habit. Because we get used to not take into account reality while problem solving". Their perceptions about transferring data to real life was effected their way of solution.

Beliefs in mathematics

Three participants' educational beliefs about mathematics caused unrealistic solutions. P1 asserted that "there is no connection between math and real life. For example derivative and integration how do you connect them to the

real life" P6 and P12 indicated that "mathematics is certain thing". They believe that solution of problems should be numerical if it is a math lesson.

Previous experience

In solving non-standard word problems previous experience of seven participants produced the unrealistic solutions. Previous classroom activities were dominant factor that caused unrealistic solutions. P2 stated that "in the classroom there were not any activities regarding reality. While we were little child there was not so much emphasis on connection between daily life and mathematics". For problem 9, participant P4 declared his/her ideas about previous learning style as follow; *I:Why did you solve like this?P4:Since we started to solve this kind of problems we solve these problems using proportion. We learnt in this way, we did not see any other form.*

Exam system

Eight mathematics teacher students stated their ideas about exam system of Turkey is a factor for their unrealistic solutions. P4 used proportion solving problem and did not consider whether it works in real life or not. P7 declared that "the reasons go beyond our primary school years", P9 stated that "in previous system there were not that kind of things, there were standard things but now everything is changing. In the past every condition was not taught us" P10 stated his/her ideas about previous experience as "mathematics experience that I experienced in the past", P11 asserted his/her opinions like "my previous living could be the reason". Participants' previous experience caused their unrealistic solutions. I:Why happened like that? *P_2:Exam system, logic of exam system in Turkey.* Participant P_3 signed his/her opinions like *"thanks to test exams we are here",* participants P_4 pointed that *"we are exam-based society. We get schools through exams and we are assigned as a teacher by means of exams"* P_5 asserted his/her idea like*"while we are study for an examination, we are getting one type person"* P_{11} asserted his/her opinions like *"I will take an exam KPSS, so I have to solve quickly".* Exam system of Turkey affected their solutions. According to their ideas they are accustomed to do multiple choice tests and choose one of the right answer, so they could not solve this kind of problems correctly.

Table 2. Suggestion of participants for overcoming unrealistic solutions

Suggestion	Participant
Interpretation of problem situation	
Extra knowledge should be given	P_1
Problems should be more explicit	P_6 P_{10}
Flexible thinking	P_{12}
Leading different thinking style	P_5
Perceptions of problem solving activities	
Associating math with daily life	P_4 P_7 P_8 P_9 P_{11}
Problems should include real life situations	P_5 P_7
Beliefs in mathematics	

Basics of mathematics should be taught in primary school level	P_{11}
Previous experience	
Concrete material	P_2
Doing math awareness	P_{10}
Not leading memorized	P_5
Reading book	P_8
Exam system	
Revision in exam system	P_5
That kind of problems should be taken place	P_{11}

Participants' beliefs about interpretation of problem situation, perceptions of problem solving activities, beliefs in mathematics, previous experience and exam system were found to be suggestions for overcoming to exclude reality in the non-standard word problems context.

Suggestion for interpretation of problem situation

Five participants suggested about interpretation of problem situation. P_1 stated that *"before solving problem extra knowledge should be given"* P_6 and P_{10} indicated that *"problems should be more explicit in problems",* P_6 asserted his/her opinions like *"choices should be given"*. P_5 declared that*"leading different thinking style"*. According to participant different thinking style should be learnt. P_{12} said that*"we should think flexible"*. As seen from the interviews participants' suggestions were about interpretation of problem situations. According to them more information should be given in problem context and thinking style should be considered.

Perceptions of problem solving activities

Six mathematics teacher students suggested about perceptions of problem solving activities. Five participants stated that mathematics should be associated with daily life. P_9 asserted his/her opinions about perceptions of problem solving activities as follow *"associating mathematics with daily life should be taught"* P_5 and P_7 declared that their beliefs like *"problems should include real life situations".* Participants declared that problem solving activities should be changed and more emphasize should be given about real life situations.

Beliefs in mathematics and previous experience

P_{11} indicated that basics of mathematics should be taught in primary school level. Four participants suggested about previous experience. P_2 asserted his/her opinions like *"abacus should be used in multiplication and division activities",* P_{10} declared his/her idea like that*"we should do mathematics awareness"* P_5 suggested that*"unneccessary information should not be given and not lead memorized"* and P_8 asserted that they should read book.

Exam system

Two participants suggested about exam system. P_5 suggested that *"revision should be framed in exam system"* and P_{11} suggested that *"that kind of problems should be taken place in exams".* Participants' suggestion was about including non-standard word problems in system of exam in Turkey.

Conclusions and suggestions

Teachers' beliefs and conceptions about word problem solving play important role for both their teaching practice and students learn (Hong, 1995; Verschaffel, De Corte and Borghart, 1997). If the future mathematics teachers are well handled about non-standard word problems, they will educate their students well qualified. The participants attended this study could apply correct arithmetical operations to solve problems and find a numerical solution but not pay attention this numerical answer whether it works in real life or not. The finding of the study seemed to be consistent with the finding of Verschaffel, De Corte and Borghart (1997). In this study when they were asked to explain the reasons it was determined some factors that emerged from the task-based interviews. There were four dominant factors that played a fundamental role for giving unrealistic solutions in solving non-standard problems. These are participants' interpretation of problem situation, perceptions of problem solving activities, previous experience and exam system of Turkey. Beliefs in math also another factor caused for unrealistic solutions of participants while solving non-standard problems.

The results of the study show that most of the participants looked for extra information, focused on the numbers given in the problem and thought very basic using the numbers presented in problem context. It can be said that participants' interpretation of problem situation was important factor for excluding reality in solving problems. This finding is parallel with the findings of Inoue (2005) and Hatano (1997). According to the results of the study participants' perceptions of problem solving activities affected their unrealistic solutions. Some of them believed that one correct solution is required so they ignored the data focusing on numerical answers. One said transferring math to real life is impossible. As seen in study of Inoue (2005) participants' perceptions of problem solving activities are another important factor for unrealistic solutions. As indicated in study of Schoenfeld (1991) beliefs of people in mathematics affected their ability in solving problems. Pre-service teachers' beliefs about mathematics like "*mathematics can not be associated real life*" and "*mathematics is a certain thing*" are underlying factors their ignoring reality in context of problem. Another important factor was previous experience of mathematics teacher students. Their previous learning style affected their way of solving non-standard word problems. Another important factor which had not been occurred in other studies was exam system of Turkey. Many participants declared that in Turkey multiple choice test system (especially selecting students while entering university and being a teacher after finished teacher trainee program) was the reason for excluding real life knowledge

presented in the problem context. Less effective factor was culture of schooling. It can be concluded that individual factors such as perception and experience were main resources on the contrary external factors like exam system and culture of schooling.

The second aim of the study was to reveal pre-service primary school mathematics teachers suggestions regarding overcoming unrealistic solutions. For interpretation of problem situation they suggested that problems should be clearer by giving extra information and also different thinking style should be taught. Associating mathematics with daily life and real life situation should be presented in problems were suggestions of participants for problems solving activities. Mathematics beliefs were another factor affecting participants' unrealistic solution. For this issue basics of math should be taught in earlier years suggested by the teacher trainees. In relation with previous experience issue, concrete material, reading book, memorized learning should not be leaded and doing math awareness were other suggestions. Participants mentioned that when the revision is done about exam system of Turkey and non-standard word problems are taken place in exam system, they deal with the unrealistic solutions and they could not exclude the real life knowledge from their problem solving efforts. In order to teach non-standard word problems to the pupils effectively somehow teachers' knowledge and performance should be enhanced during their school time. It is clear that the more pre-service elementary school mathematics teachers' beliefs and knowledge are improved the more its contribution of teachers' instruction and students learning will be enormously. The results of the study indicated that in the education of pre-service mathematics teachers it is necessary to integrate this type of problems in math courses. Considering the individual factors are much more effective for unrealistic solutions than external factors, it should be given more attention about this factor.

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