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EXAMINATION OF CONTEXT-BASED PROBLEM-SOLVING ABILITIES OF PRE-SERVICE PHYSICS TEACHERS

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Abstract. *In recent years, while the context-based approach has been popular and the teachers have been using it in the classrooms, it is seen that they do not prefer using context-based evaluation techniques. This becomes a problem for students because they used to be taught in the context-based approach enriched by daily life examples and then they are measured by paper and pencil tests. From this point of view, the aim of this research was to examine the ability of the pre-service physics teachers creating context-based problem about pressure. A case study approach was used to answer the research questions. The research was carried out in a university on the north coast of Turkey. Participants were 25 pre-service physics teachers between 20-24 ages. Pre-service teachers were firstly taught the context-based approach and then to write context-based problems. In data collection process, they prepared context-based problems and they were evaluated by a rubric consisting six criteria and three categories. After data analysis, it was found that pre-service teachers remained in the middle level in terms of creating context-based problems. In undergraduate or graduate programs, pre-service teachers and teachers should be informed about the context-based approach and context-based evaluation techniques so that they can effectively use them.*

Key words: *context-based evaluation, context-based problem, pre-service physics teachers.*

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Introduction

As a science, physics examines the complexity underlying the order in nature and in the environment, and also examines the logical implications of this complexity. From this point of view, information is born of some sort of complexity and the thoughts of problems. In fact, problems are one of the basic elements that provide communication in the learning environment (Bilen, 2006). One of the main objectives of science education is to train scientifically literate individuals who follow the technological and scientific developments. Science literacy as a general term is a combination of science-related skills, attitudes, values, insights and knowledge necessary for individuals to develop research-questioning, critical thinking, problem solving and decision-making skills, being lifelong learners, and maintaining curiosity about the world around them (Kavak, Tufan and Demirelli, 2006).

The quality of science education needs to be increased in order to be able to raise scientific literate individuals. To this end, a special emphasis has been placed on concept teaching and the identification of existing alternative concepts of students in recent years because students often come to science lectures with their own theories and ideas that do not overlap with scientific ones (Hewson and Hewson, 1984; Posner, Strike, Hewson and Gertzog 1982; Roth, 1985). These concepts, which each individual has developed, differ from the scientific meanings accepted by the scientific world. This is named "misconception" by Helm (1980); "alternative frameworks" by Driver (1981); Gilbert, Osborne and Fensham (1982) have named it "children's science". According to Disessa (1993), misconception is that the knowledge taught is understood in a wrong way, while the alternative conception spontaneously evolves in the student.

In recent years, countries have reorganized science curricula and put up-to-date teaching approaches and learning theories into practice. One of these learning theories is constructivist learning theory. The most important thought that this learning theory focuses on is the current knowledge of the student. Constructivist learning theory is essentially the building of new

learned information in relation to existing preliminary information. This is also the basis of the context-based approach and makes it necessary for the student to present familiar contexts when associating preliminary information with new information. For this reason, the context-based approach is an approach arised from constructivist learning theory that can be used to associate scientific knowledge with events that students encounter in everyday life (Kortland, 2010). The aim of this approach is to improve students' interest, motivation and achievement in the classroom (Bennet and Lubben, 2006; Boström, 2008; Campbell, Lubben and Dalimini, 2000) and to conduct physics lessons based on contextual examples from real life to improve problem solving skills (Park and Lee, 2004; Taasoobshirazi and Carr, 2008). Using the concepts in the relevant contexts contributes positively to the learning process by context-based approach. In this sense, it is expressed that an effective learning takes place if students can relate a concept and its practices to the real world that includes their own culture, family or friends (Tekbıyık, 2010; Yam, 2005). If appropriate contexts are used, it will be easier for students to recognize the physics relation to real life. As a matter of fact, the teachers' views on the context-based approach are examined, it is found that, they think the context-based approach motivates learners to learn and increase interest in the lesson, increases the desire of the student to choose a career related to the course, allows the students to work freely, allows the students to take care of daily life issues and allows them to work more. At this point it can be said that the context the teacher chooses for the topic is very important. According to Çekiç Toroslu (2011) and De Jong (2006), the rules to be considered in context selection are as follows:

1. Gender should be considered in context selection. The studies revealed that the interest of girls and boys is different. The chosen context should address both student groups and be well known by the students.
2. The context should not distract students from the concepts they are interested in learning.
3. Contexts should be selected that will attract students' attention and increase their motivation.
4. Contexts should be selected that students should be familiar with their close surroundings and where they can interact directly.
5. Contexts should be chosen that are not too confused and promote content best.

Furthermore, it is more appropriate to use context-based assessment and evaluation techniques after teaching with context-based approach (Akpınar, 2012). Studies have shown that context-based physics problems are more effective in student motivation and in increasing learning success. In addition, the use of problems based on everyday life also contributes positively to problem solving skills of students (Park and Lee, 2004; Taasoobshirazi and Carr, 2008). Problems have a lot of functionality in the learning process. For example, guiding teaching and improving student learning, facilitating classroom management, increasing interaction within the learning environment, providing motivation, and developing problem-solving skills (Kurnaz, 2013). The problems that most improve students' problem solving skills are problems that will enable them to analyse, synthesize and evaluate.

When the studies are examined, although the context-based approach is very popular in recent years, context-based measurement and evaluation methods and techniques are not often preferred (Ültay and Dönmez Usta, 2016). Context-based approach, however, will be more beneficial in terms of students being assessed by using context-based assessment and evaluation methods and techniques (Akpınar, 2012; Rennie and Parker, 1996). This is because the encounter of classical questions by students after they have been made taught within the contexts in which they are familiar can lead to their dilemma between the two approaches. Also, according to Wilkinson (1999), context-based problems contribute more to conceptual learning of students than classical problems. While classical problems usually focus on recalling memorized information, context-based problems require students to understand more conceptually, as well as improve their ability to interpret.

It is seen that the results of the studies made in this subject are different from each other in the success measurement. For example, Rennie and Parker (1996) found that student achievement in the context-based questions was higher than classical questions; Georghiades (2006) finds the opposite, Park and Lee (2004) find that student success is the same in both types of questions. In addition to these studies, Song and Black found that students' achievement of interpretation skills was higher in context-based questions, whereas achievement was higher in classical questions (cited by Çekiç Toroslu, 2011). Another work on context-based questions was made by Kaiser, Jonides and Alexander (1986). Kaiser and others have found that students are more successful than abstract questions of familiar content, but cannot generalize methods of using familiar concepts to apply to abstract questions.

In Park and Lee's research, they stated that students understood that basic concepts were easy to understand in the context of non-contextual questions, but that these concepts were difficult to apply in everyday

life, therefore they preferred contextual questions. According to students of Park and Lee's research, the reasons of finding difficult context-based questions were given in the following:

- Some students try to include personal / subjective judgments that are not included in the question.
- Some students fail to understand the problem situation or context.
- Some students do not understand the logic of the information given because the values of the digital information are in an unspecified range or are not expressed in a simple form like an integer.
- Some students miss some important explanatory information in long sentences.
- Some students worry about unrelated information.
- Some students are forced to solve the problem because the structure of the problems differs from the ones used in the tests in the school (p.1589).

Rennie and Parker (1996) collected students' thoughts on contextual questions in four parts as a result of interviews with students. These items are:

- Contextual questions are often easier to imagine.
- The information given in the question can lead to confusion and an inability to understand the problem if they are not related to the contrived and the physics concepts to be used in the solution.
- Context-based and non-contextual questions are often the same difficulty.
- Questions that need to be answered as written text, whether context-based or not, are more difficult than the questions to be treated. Because it is not clear how wide the answer will be in such questions, the answer to be given to the questions that need to be made is obvious.

The common point of Park and Lee and Rennie and Parker's lists may be that unfamiliar information included in questions may distract the students from solving the problem. Nonetheless, according to Rennie and Parker, despite the reasons Park and Lee have tackled about the difficulty of context-based questions to learners, students think that context-based questions are easier to imagine, and that contextual questions and classical questions are often the same difficulty.

It is understood from these researches that there is no consensus between the researches' results. Because of this, this research is supposed to make contributions in current debate. But it is obvious that if a lesson is carried out within context-based approach, it is more suitable to use context-based evaluation methods or techniques. Otherwise, students will struggle to understand why the lesson was context-based and the evaluation questions were non-contextual and they will have difficulty to transfer their knowledge between two types of setting (contextual and non-contextual).

Pressure is a subject that students often experience and are curious about in daily life (Ünal and Ergin, 2006). Many pressure-related events, such as breathing with our lungs, pumping caliber blood, and wearing special clothing for divers and astronauts, are issues that will be the basis for higher education levels, as they are intertwined with everyday life and need to know the granular structure of the substance (She, 2002). It is difficult to learn this topic from the conceptual point of view because it is found as abstract by the students (Bozan and Küçüközer, 2007; Şahin and Çepni, 2012). The excess of misconceptions that students have in this issue is noteworthy (Basca and Grotzer, 2001; Kariotoglou and Psillos, 1993; Önen, 2005; Sere, 1982). For this reason, evaluating students with context-based problems about the pressure they perceive to be present in almost every aspect of everyday life can give them the opportunity to focus on different aspects of the subject. They may perceive the concept of pressure not just as a physics/science topic, but as a construct that constitutes the basis of some interesting events. From here it can be said that the aim of this research is to examine the ability of the pre-service physics teachers to create context-based problem about pressure.

Methodology of Research

In this research, a case study approach was used to examine the characteristics of the sample group in depth (Çepni, 2005). In this sense, it can be said that the research has a descriptive side because the documents were analysed according to a rubric and it was tried to show the whole picture.

Sample

This research was conducted by a group of 25 pre-service physics teachers from seven different regions such as Marmara, Black Sea, Mediterrean, Egean Regions, etc. of Turkey. Their ages were between 20-24 and they were coded as; PTC1, PTC2, PTC3... PTC25.

In Turkey, there are two ways of becoming a teacher. In the first way, students go to Faculties of Education of universities and at the end of 4 or 5 years with successful grades, they get an undergraduate degree. In the second way, students go to Science Faculties of universities and at the end of 4 years with successful grades, they get an undergraduate degree. After that, if they want to be a teacher, they have to get a pedagogical formation program in Faculties of Education. They have to take some education courses such as Introduction to Education, Classroom Management, Philosophy of Education, Special Teaching Methods, etc. But, in both ways, students have to enter an exam called Public Personnel Selection Exam (KPSS in Turkish) in Turkey to be assigned as a teacher. Then, students can be assigned to a school according to their Public Personnel Selection Exam grades.

The sample in this research is composed of students who choose the second way. They were graduated from Physics Departments of Science Faculties and they studied to the pedagogical formation program. This research was carried out within the scope of Special Teaching Methods course. In this course, some teaching methods were taught such as problem-based learning, constructivism, context-based approach, etc.

In Faculty of Education, students take much more courses related to the education. But in the second way, their education courses are limited to 7-8 courses and so pre-service teachers have difficulty in understanding educational topics. In this research, it can be regarded as a limitation.

Implementation

In the research, firstly, pre-service physics teachers were informed about the context-based approach during 6 lesson hours (6 * 50 = 300 minutes), while discussing them in class by examining sample lesson plans built around the context-based approach. Then context-based evaluation was presented and appropriate sample problems were presented. Differences between traditional and context-based problems were discussed. Traditional problem requires recalling knowledge, whereas context-based problem requires deeper understanding (Wilkinson, 1999). At the end of this period, the pre-service physics teachers were asked to write context-based problems about the pressure unit, which attracted attention of pre-service physics teachers and was an issue in daily life. For this purpose, pre-service physics teachers were given 2 weeks to prepare context-based problems.

Data Analysis

Rubrics (or rating scales) were used to evaluate the resulting data. Rubrics are scoring scales used by teachers or other interested persons to help students guide their learning process or discover their understanding. In addition, rubrics also assist teachers in examining learning tools and understanding how to support learning (Moskal, 2000; Truemper, 2004).

Rubric types are divided into two parts: holistic and analytic. The holistic rubric type evaluates by giving a single decisive point expressing the quality of performance (Linn & Gronlund, 1995). In other words, it makes a holistic assessment of a finished product. Analytical rubrics divide the performance into pieces and make the evaluation of each piece separately. Within the scope of this research, a holistic evaluation table had been developed and the evaluation had been carried out accordingly. While the rubrics were being developed, the relevant literature was first examined. As a first step, the final goal had been determined to be summarized as points for any event. The conditions, processes and performances that pre-service teachers should show in their products were defined. Brainstorming had been done in order to explain and describe every situation. In both cases, narrative/descriptions were written with the help of Tekbıyık and Akdeniz's (2010) study in which the previously defined criteria. For each criterion, degree discrimination was made, rubrics were critically examined, and necessary arrangements were made. These processes were mainly necessary to design a rubric in the literature parallel to certain steps (Eppink, 2002; Gallo, 2004; Mertler, 2001).

The rubric used by the researcher for data collection purposes is shown in Table 1. As shown in Table 1, the rubric consisted of six criteria and three categories which were adapted from Ültay and Dönmez Usta's (2016) study.

Table 1. The rubric used in this research.

Criteria	Not Adequate	Partially Adequate	Adequate
1. Selecting daily life context.	Daily life context is not selected.	Daily life context is selected but it is partially related to the pressure.	Daily life context is selected and it is related to the pressure.
2. Relating pressure and related concepts with daily life.	Context-based problems do not make feel that pressure and related concepts are related to daily life.	Context-based problems make feel that pressure and related concepts are partially related to daily life.	Context-based problems make feel that pressure and related concepts are related to daily life.
3. Containing a scenario, an event or a story.	Each context-based problem does not contain a scenario, an event or a story.	Each context-based problem contains a partially relevant scenario, an event or a story.	Each context-based problem contains a scenario, an event or a story.
4. Facing with a case that student may solve or propose a solution.	In the context-based problem, students do not face with a case that they may solve or propose a solution.	In the context-based problem, students face with a case that they may partially solve or propose a solution.	In the context-based problem, students face with a case that they may solve or propose a solution.
5. Creating context-based problems that can be encountered in real life.	Context-based problems are not created as can be encountered in real life.	Context-based problems are created as can be partially encountered in real life.	Context-based problems are created as can be encountered in real life.
6. Taking all objects in the context-based problems from real life.	All objects in the context-based problem are not taken from real life.	Some objects in the context-based problem are taken from real life.	All objects in the context-based problem are taken from real life.

Reliability and Validity

Some questions about rubric can be asked to determine the validity of rubric. The question asked about content validity within the scope of the research; "Is there a content area that cannot be evaluated by the rubrics on the homework or products to be examined? " The question asked about construct validity is "Does it contains all the important points of constructions designed to be evaluated by the scoring metrics? " The question asked about the criterion validity is "Is there a point that is not revealed by the related performance score measurement? " These questions were tried to be answered and tried to understand the validity of the rubrics. Also, the reliability of the rubrics "Are the rating categories explained well enough? And "Are the differences between the categories clearly defined? " These items were created in parallel with the study of Tuncel (2011). Expert opinions had also been utilized and finalized for the reliability and reliability of the developed rubrics.

Results of Research

The distributions and frequencies of pre-service teachers according to context-based problem-writing criteria are shown in Table 2 according to the rubric, which is prepared to examine the ability to write context-based problems on pressure.

Table 2. Distribution of pre-service physics teachers' context-based problems according to the criteria in the rubric.

Criteria	Not adequate		Partially adequate		Adequate	
	PTC	*f*	PTC	*f*	PTC	*f*
1. Daily life context is selected.	PTC3, 4, 11, 12, 15	5	PTC1, 5, 8, 16, PTC17, 22, 23, 25	8	PTC2, 6, 7, 9, 10, 13, 14, 18, 19, 20, 21, 24	12
2. Context-based problems make feel that pressure and related concepts are related to daily life.	PTC8, 11, 12, 15, 25	5	PTC2, 3, 4, 9, 16, 17, 20, 22, 23, 24	10	PTC1, 5, 6, 7, 10, 13, 14, 18, 19, 21	10

Criteria	Not adequate		Partially adequate		Adequate	
	PTC	*f*	PTC	*f*	PTC	*f*
3. Each context-based problem should contain a scenario, an event or a story.	PTC3, 11, 16, 22, 25	5	PTC1, 2, 4, 5, 6, 8, 12, 14, 15, 17, 21	11	PTC7, 9, 10, 13, 18, 19, 20, 23, 24	9
4. In the context-based problem, students should be faced with a case that they may solve or propose a solution.	PTC2, 5, 7, 8, 11, 12, 15, 16, 17, 21, 24	10	PTC1, 3, 9, 13, 19, 20, 22, 25	8	PTC4, 6, 10, 14, 16, 18, 23	7
5. Context-based problems should be created as can be encountered in real life.	PTC5, 11, 12, 15, 16, 25	6	PTC3, 4, 6, 8, 17, 21, 22, 23	8	PTC1, 2, 7, 9, 10, 13, 14, 18, 19, 20, 24	11
6. All objects in the context-based problem should be taken from real life.	PTC15	1	PTC1, 3, 4, 5, 7, 8, 9, 11, 12, 17, 19, 22, 25	13	PTC2, 6, 10, 13, 14, 16, 18, 20, 21, 23, 24	11
Total:		**32**		**58**		**60**

In Table 2, it is tried to show how the pre-service physics teachers were inclined to the context-based problem-writing criteria through the developed rubric while writing the context-based problem of pressure. According to the general aggregation, the frequency of pre-service teachers who were found inadequate was 32, the frequency of pre-service teachers that suffices partially adequate was 58, and the frequency of pre-service teachers who sufficed adequately was 60. In other words, according to the table in which 150 cases were considered, the pre-service physics teachers were found to be approximately 21% (32/150) inadequate, 39% (58/150) partially adequate and 40% (60/150) adequate on the skill of writing context-based problem.

According to the table, for the criterion of "Daily life context is selected" 5 pre-service physics teachers were found inadequate, 8 pre-service teachers were partially sufficient and 12 pre-service teachers were adequate. This criterion was that there were 5 pre-service physics teachers who had met inadequate level.

The second criterion "Context-based problems make feel that pressure and related concepts are related to daily life" was provided by 5 pre-service teachers inadequately, while the remaining 20 pre-service teachers were found partially sufficient and the other half adequate.

The third criterion "Each context-based problem should contain a scenario, an event or a story." 5 of the pre-service teachers were inadequate, 11 were partially adequate, and 9 were sufficiently competent.

The fourth criterion was the frequency of 10, 8, and 7 pre-service teachers who, in turn, were inadequate, partially adequate, and sufficient to meet the criterion "In the context of context-based problems, students face a situation where they need to solve or propose solutions."

According to the Table 2, there were 6 pre-service physics teachers inadequate in the criteria of "Creating context-based problems that can be encountered in real life", 8 pre-service physics teachers were partially adequate and 11 pre-service teachers were sufficiently competent.

The last criterion, "Taking all objects in the context-based problems from real life", was provided by only 1 of the pre-service physics teachers with an insufficient level, while the remaining 24 teachers were partially sufficient and 11 were sufficient.

Discussion

For the first criterion, the findings were parallel with the findings of İlhan, Doğan and Çiçek's (2015) studies, it was found that pre-service teachers were forced to relate contexts and concepts and to prepare questions related to daily life. For example, PTC4 briefly mentioned that two friends named Ali and Ahmet walked on the beach and because of dropping of the bag in Ahmet's hand, Ali dropped the bottle of soda while taking the bag from the place and the two friends made a swim competition. However, PTC4 did not use any context in the questions that he created after this short story, and included questions that could not have been deduced from the story. For example, one of the questions was, "Which one was deeper as a result of the swimming competition". This situation is paralleled by the finding that Ültay and Dönmez Usta (2016) and Topuz, Gençer, Bacanak and Karamustafaoğlu (2013), because some of the teachers did not understand context-based learning, so their problems were not

context-based. Another question was the PTC4 prepared, which was unreasonable, impossible to deduce from the story, and not using context, as "Ahmet's weight was 500N, and the shoes covered area is $4m^2$", then what was the pressure that Ahmet exerted?. This may be because the pre-service teacher may had difficulty in relating the pressure information to the inability to associate it with everyday life. This finding supports the finding that Önen (2005) suggests that some of the students are confused about concepts of pressure and force. On the other hand, PTC5, who had been found partially adequate in writing context-based problems on pressure, talked about the subject of pressure from daily life in the last part of the story he created. However, all of the questions after the story were related to pressure. For example, one of the questions was "What was the benefit of Ege benefiting from the press of the solids in the case of thieves? „ This is supported by the findings of Ayvacı (2010) that some students are missing at the point of using daily life samples. PTC7 had chosen the context of "snowball" from daily life in accordance with this criterion to a sufficient level and formed the story within this context and also put the questions about pressure under the story. For example, one of the questions was "Which of the following events was related to the reason for Seyhan's snow sinking"?

For the second criterion, the reason why the 5 pre-service physics teachers had not developed problem-solving skills by relating to daily life can have been considered that the findings of Basir, Alinaghizadeh and Mohammedpour (2008), supported by the finding that the practices of the science classes were broken down to real life. This is because students who have learned science subjects through everyday life examples in their student life will not have difficulty in relating context-based problems to everyday life when they are pre-service physics teachers. These findings are also parallel to the findings of İlhan et al. (2015) that the pre-service teachers have difficulty in associating contexts and concepts and preparing questions related to daily life. For example, PTC16 asked, "What should have an engineer paid attention to when building a house roof in a place where the wind was abundant?" reaching this criterion to a sufficient extent. An engineer, building a house roof, is hardly ever an example of daily life because it is difficult for every student to know. PTC11 in the story he created and the questions he made, mentioned the two-storey pool with taps at the lower points, whose floors were different in size from each other. Since this situation is almost unheard of in real life, PTC11 was found inadequate in this criterion. In his story and his questions, PTC1, who was about the "clogging of the ears due to the fall of the air pressure as he ascended to the heights", felt the relation of pressure and pressure concepts to everyday life and adapted sufficiently to this criterion.

When we looked at the findings of the third criterion, for example PTC16 was found inadequate because he left the question without using a story, scenario, or event, only posing the question, "In an underground city, can you have explained why you cannot have burned a lighter, even if you can have breathed." The result of Kurnaz's (2013) study showed that teachers' perception of both the traditional problem and the context-based problem on the basis of more questions and problems explains the existence of pre-service physics teachers who have not been adequately provided this criterion. It is because it seems that the 5 pre-service physics teachers had not focused on asking questions instead of creating a problematic story. On the contrary, PTC18, all the context-based problems he prepared were related to the story he created. For example, "Please explain, how did snowflakes prevent my grandfather from snow sinking?", "I could have not cut the wood with the blind axe but my grandfather did cut. How can you tell me how it can be possible," and "When the bottle was half full, it did not break. But explain why it was broken when it was about to be filled."

It seems that the PTC16 were found inadequate for the third criterion, but satisfied the fourth criterion. For example, this pre-service physics teacher made a question by using the principle of decreasing pressure at the place where the velocity of the fluids increased to open the cover of a jar, and felt that there was a need for solutions to solve the problem. In addition, the PTC14 asked for completion of the story by leaving the end of the story-based questions. In this way, the pre-service physics teacher had made this criterion adequate by leaving the students in a position to solve. However, PTC11 mentioned a two-story pool in her story and portrayed the situation. When the part of the questions was passed, the students who would have solved the question would have been asked to leave the answer with a physics question instead of producing some solution ways for the question. For example, a question prepared by PTC11, "What was the ratio of fluid pressures at points A and B is P_A/P_B?" This situation is parallel to the findings of Bozan and Küçüközer (2007) that the existence of some teachers who do not agree with the suggestions that "the problem is different from textbooks or exercises". This may be because the pre-service teacher has faced more often with traditional assessment methods and therefore has based its contextual problem on a closed-ended question that has the only correct answer. Furthermore, the question that the PTC11 had prepared, also supported the finding of Kurnaz (2013) that teachers do not provide technical information on the preparation of traditional and context-based problems.

For the fifth criterion for example, the Torricelli Experiment, the Magdeburg Experiment, Pascal's Barrel Show were mentioned. Although these famous experiments are important for physics, questions based on these experiments are not qualities that can be encountered in everyday life. This is supported by the fact that Topuz et al. (2013) find that it is difficult for teachers to practice context-based approach in class, because it is difficult to associate each topic in science class with everyday life and to give examples. This is also supported by the finding of Tural (2013) that the teachers are inadequate in giving daily life examples. The inadequacy of this criterion is may be because pre-service teachers' level of awareness of the pressure-related situations in daily life may be insufficient.

Pre-service physics teachers were found almost insufficient for the last criterion. For example, although the PTC15 created a story about real life, the questions he prepared were not made up of the objects encountered in real life. For example, the fourth question prepared by the PTC15 was a question made with a mercury manometer. Since the mercury manometer is beyond being an object that is encountered in real life, the pre-service teacher was inadequate in this criterion. It can be considered that the reason for this is the fact that the teacher's knowledge about the pressure of the teacher is seen as limited in the lessons and is not deep enough to recognize everyday life examples. However, the PTC2 had created both the scenario, the story or the event that he had created, and the questions he had prepared from the objects and situations that everyone can have understood and experienced from everyday life. A father and a son in the story of the PTC2 talked about the effect on their ears by the influence of the open air pressure while travelling in the car and the PTC2 asked that "The reason of Ali's feeling pain while in travelling on the sloping road was …..". By this question the PTC2 asked the student to find the solutions in the real life situations as well as asking for the solution ways. In this context, PTC2 fit in the fifth and sixth of the context-based problem-writing criteria.

Conclusion and Recommendations

In this research, it is reached that pre-service teachers had a medium level of ability to write context-based questions. For this reason, in undergraduate or graduate programs or seminar work in the MoNE (Ministry of National Education), pre-service teachers and teachers should be informed about the context-based approach so that they can effectively use these approach-based applications.

Pre-service teachers had reached the medium level of selecting daily life context, relating pressure and related concepts with daily life, they were not so successful at creating problematic cases that can be needed to be thought on or can be improved students' thinking abilities. It is seen that pre-service teachers perceived context-based problems simply as a daily life case.

In this research context, it is understood that adequate content knowledge and the knowledge for the context-based approach are needed to create context-based problems. All pre-service teachers in the sample were graduated from the department of physics, it is assumed that they had enough content knowledge. But at this time, they were not got used to apply an educational approach in a classroom. It was tried to overcome by explaining and teaching the approach, and examining sample practices during 6 lesson hours but it may not have been accomplished by all pre-service physics teachers. It is suggested that in a longer period the approach should be taught and discussed. Pre-service physics teachers should prepare their own context-based lesson plans and use context-based problems all together. For this reason, the important point of the pre-service teachers were able to write questions in accordance with the nature of the context-based approach. Prior to asking pre-service teachers to create context-based problems, asking them questions that will gain context-based problem-solving skills and informing them about the context-based approach can improve their ability to creating problems by providing them with better awareness.

A science-based course with a context-based approach will prevent some science topics from being abstract and therefore meaningless for students. Therefore, it can be positive that in-service training and encouragement of teachers to use context-based practices in the teaching process can be beneficial. Because, as a result of the research, it is seen that the important part of the pre-service physics teachers had the ability to write questions according to the nature of the context-based approach.

As discussed before in the introduction, authentic contexts are influential in increasing students' interest and motivation. The higher the representation power of the selected context, the more effective the context is. Therefore, it should be possible to include examples and contexts encountered in science textbooks and practices in everyday life.

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