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The opinions of primary mathematics student-teachers on problem-based learning method

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Abstract

The purpose of this study is to determine how Problem-Based Learning (PBL) approach, which is one of the learning approaches where real life like problems are used in order to provide opportunities to learners so as to reach the objectives which was covered in educational programmes and to use critical thinking and problem solving skills effectively, was perceived by student primary mathematics teachers. With this mind, 42 pre-service elementary mathematics teachers who took the elective "Problem-Based Learning in Mathematics Teaching" course participated to the study. The data were collected via "reflections about problem-based learning" form prepared by the researchers. Pre-service teachers were asked to answer four diverse questions in the form. The data were analyzed descriptively under four different headings. The results of the study and the implications will be shared.

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Keywords: Problem Based Learning, opinions of pre-service mathematics teachers

1. Introduction

Problem-based learning (PBL) method which we are accustomed to its basic futures has been used in medical education for the first time in 1996 by Barrows and gradually applied to educational studies of other scientific fields. These studies which started with the leadership of Barrows are perceived as effective methods for bringing up qualified individuals for the needs of today's societies.

PBL is not a new concept. Plato and Socrates used PBL forms and on the contrary of teacher centered education in many of today's school, asked their students to think, to collect information for themselves, and to discuss this information at class by running after new information. The historical foundations of PBL became visible with John Dewey who used methods such as interrogative education and apprenticeship (Sünbül, 2011).

According to Barrows (1996), the features of PBL are the following: (1) Learning is learner-centered. (2) Learning takes place in small learner groups. (3) Teachers are facilitators and guides. (4) Problems organize students' focus and apply learning. (5) Problems are means for improving problem solving skills. (6) New information is acquired by individual learning.

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Constructive learning theory asks learners to be active participants during the learning process and to construct new information according to their meanings. Also in PBL's approach, since active learning includes elements such as the necessity of learning to be based on experience and living, being responsible from learning process and working with a group, it overlaps with constructive learning theory. It was expressed by many researchers that PBL approach was one of the good examples of constructive learning environment and basically it was a constructive learning method (Savery & Duffy, 1995; Ronis, 2001; Saban, 2004; Yaman, 2003). Choosing constructive learning theory as the baseline makes also learning by doing and living more effective. Besides, since constructive learning approach is based on how the students learn instead of what they learn, PBL is an important process for realizing learning in environments where learners are responsible from learning.

In PBL methods teaching starts with a problem. With the problem given within the context of a scenario, a connection with the learner's world is established. Problems are only organized on subjects not on disciplines. Small groups are created for effective, related and complete learning. Students are given full authority for shaping problem and to manage solution from start to finish. Constant explanations and information are provided for students about their performances and solutions (Yenilmez & İşgüden, 2007).

In PBL, students study in groups and the teacher has the role of a facilitator, a guide and a director in learning action. This approach helps students; (1) to make sense of information, (2) to improve effective problem solving skill, (3) to acquire lifelong learning and individual learning skills, (4) to improve fruitful collaboration, (5) to improve intrinsic motivation in learning and to be productive individuals (Hmelo-Silver, 2004):

The purpose of this study is to determine the opinions of student primary mathematics teachers regarding problem based learning. According to this purpose the answers of the following questions were searched:

1. What do they think about PBL method?
2. What do they think about writing problem scenarios in PBL method?
3. What do they think about the probable effects of problem scenarios in PBL method on learners?
4. What do they think about the practicability of PBL method to everyday teaching?

2. Method

2.1. Design of the Research

This is a descriptive study, as the purpose of this study is to determine students' opinions on PBL method.

2.2. Study Group

The study group of this study consisted of 42 senior students who have PBL courses in teaching mathematics in Kocaeli University, Educational Faculty, and Teaching Primary Mathematics Department in 2011-2012 academic years.

2.3. Data Collection Tools, Collecting Data and Data Analysis

The data was collected with a data collection form which was composed of open-ended questions and prepared by the researchers. Student teachers were given 20 minutes to fill in this data form. The data was interpreted after it was analyzed descriptively.

3. Findings and Comments

The opinions of student teachers for the first research problem which was determined as '*What do they think about PBL method?'* are as in the following:

Table 1: The opinions of Student Teachers on first research problem

Category	Frequency	Percentage
Time	11	26%
The Difficulty of the Method	6	14%
The Persistency of the Method	3	7%
The Necessity of the Method	11	26%
The Usefulness of the Method	4	10%
Usability	7	17%
Total	42	%100

The data obtained from student teachers were grouped under 6 categories. It was seen that 11 teachers stated their opinions under the category of **'Time'** and it was determined that all student teachers included expressions regarding this method was time consuming. For example:

'… This method will take most of our time both before and during lessons.'

'This method is implemented better with the time allocated to the subjects, because more time should be given for this method.'

'It is effective in making learning permanent, but it is time consuming.'

At the **'The Difficulty of the Method'** category, it was seen that 6 student teachers stated their opinions and was determined that they expressed their opinions regarding that there were difficulties both in preparation and practice phases. The opinions are as in the following:

'… It is a little bit difficult and challenging method.'

'It is a little bit difficult to get results in both cases by using problem-based learning method.'

At the **'The Persistency of the Method'** category, it was seen that 3 student teachers stated their opinions and student teachers expressed opinions regarding that PBL was effective in making subjects permanent. Some of the opinions are as in the following:

'As it can be a more catchy learning style in terms of students, it is a method that should be practiced.'

'It is available to provide persistency as it canalizes students to think.'

At the **'The Necessity of the Method'** category, it was seen that 11 student teachers stated opinions which emphasized the skills that could be acquired as s result of PBL practices. For instance:

'I think it is a good method as it canalizes students more to discover, to find and to research …'

'It improves students' problem solving, discussion and thinking skills …'

'It improves students' ability to analyze and provides them multiple thinking…'

At the **'The Usefulness of the Method'** category, 4 student teachers used sentences regarding PBL was useful for students and was a student-centered method. For instance;

'…solving an intriguing problem can be entertaining for a student. For this reason, this method is effective.'

At the **'Usability'** category, it was appeared that 7 teachers expressed their opinions regarding that it was not necessary to use this method.

The opinions of student teachers for the question which is the second research problem '*What do they think about writing problem scenarios in PBL method?*' are as in the following:

Table 2: The Opinions of Student Teachers for the Second Research Problem

Category	Frequency	Percentage
Writing Characteristics	12	29%
Difficulty of Writing	14	33%
Realism	6	14%
Attractiveness	3	7%
Boringness	2	5%
Time	5	12%
Total	42	100%

The data obtained from student teachers were grouped under 6 categories. Student teachers' comments regarding these categories are as in the following:

12 student teachers who stated their opinions for '**Writing Characteristics'** category talked about the characteristics that a scenario should have by emphasizing the requirements of scenario writing in PBL method. For instance;

'Generated scenarios should consist of problems that students may encounter in their daily lives. Problem scenarios must be clear and understandable.'

'First of all, the names of people and places etc. used for getting attention should be attractive. They should not be long in order not to be boring. There should be excerpts from daily life. It should be suitable to students' levels. It should be neither difficult nor easy.'

14 student teachers who stated their opinions for '**Difficulty of Writing'** category focused on the point that it was exhausting for teachers by referring the difficulty of writing scenarios. Some of these opinions are as in the following;

'Writing a scenario is really a difficult process but we teachers make our own updates and improvements by producing this kind of scenarios'

'…It is extremely difficult and painful job…'

6 student teachers who stated their opinions for '**Realism'** category focused on the necessity of writing realistic scenarios for getting students' attention by referring the necessity of compatibility of scenarios with the real world. As follows;

'..There should be excerpts from daily life…'

'As it is inside the human life, it combines lessons with the life...'

'There should be complicated problems related with real life'

3 student teachers who stated their opinions for '**Attractiveness'** category reported that scenarios should be written so as to attract students' attention. These opinions are as in the following;

'.. The important thing is to try to write on subjects which attracts students' attention'

5 student teachers who stated their opinions for '**Time'** category accepted writing an effective and true scenario as time consuming by referring the importance of method for students and teachers. For instance;

'Writing scenarios is quite time consuming but it is useful in terms of having permanent information in some subjects'

'Creating problem scenarios takes much time but a good scenario provides permanent learning'

For the category of '**Boringness'**, 2 student teachers stated another difficulty of writing scenarios for teachers by making comments.

The opinions of student teachers for the question which is the third research problem '*What do they think about the probable effects of problem scenarios in PBL method on learners?*' are as in the following:

Table3: The Opinions of Student Teachers for the Third Research Problem

Category	Frequency	Percentage
Improving Thinking Skills	15	38%
Getting Attention	4	10%
Active Participation	3	7%
Arousing Interest	4	10%
Persistency	6	14%
Difficulty-Complexity	10	21%
Total	42	100%

The data obtained from student teachers were grouped under 6 categories. Student teachers' comments regarding these categories are as in the following:

15 student teachers who stated their opinions for '**Improving Thinking Skills'** category stated that problem scenarios in PBL methods improved students' thinking and reasoning skills. These opinions are as in the following;

'… A good scenario can improve their thinking skills more…'

'…. Classes can be more enjoyable for students, their thinking skills improve…'

4 student teachers stated their opinions for '**Getting Attention'** category. The opinions of teachers who emphasize on the permanency of learning by getting students' attention to lessons with the help of problem scenarios are as in the following.

'After finding a scenario which attracts students' attention, the learning will be permanent for students'

'It attracts students' attention and makes lessons more enjoyable'

3 student teachers stated their opinions for '**Active Participation'** category by expressing that using problem scenarios in PBL provided active participation of students during lessons. These are as in the following;

'Students with PBL in comparison with traditional lectures are more active in lessons by participating in problem solutions in addition to that permanent learning takes place since they solve by acting and doing'

4 student teachers stated their opinions for '**Arousing Interest'** category by expressing problem scenarios would canalize students' interest to lessons and subjects. For instance;

'As the problem is not presented directly to student and as it is presented with a scenario, it can be more attractive. This interest can motivate students positively.'

6 student teachers commented as problem scenarios in PBL created permanent effects on students' learning for '**Persistency'** category.

'…If a scenario was written according to social environments of the students, the learning of the students would be more permanent.'

10 student teachers stated their opinions for '**Difficulty-complexity** category by expressing problem scenarios in PBL made understanding the subject and learning more difficult for students. These opinions are as in the following;

'Some scenarios bore students, some may canalize their attention to another direction. It can be more complicated for students.'

'I think that complicated and long scenarios are boring and difficult to understand.'

The opinions of student teachers for the fourth research problem '*What do they think about the practicability of PBL method to everyday teaching?*' are as in the following:

Table 4: The Opinions of Student Teachers for the Fourth Research Problem

Category	Frequency	Percentage
Positive	25	60%
Negative	17	40%
Total	42	100%

The opinions of student teachers for the research problem 'What do they think about the practicability of PBL method to everyday teaching?' were analyzed as positive and negative and it was seen that most of the student teachers who participated at the study stated that they would use PBL method during their teaching careers. Some of them are as in the following:

'I am thinking to use this method with new subjects without boring students for subjects that can be adapted to scenarios.'

'The practicability of the subject is high. It prevents saving time as it takes more time for the subject. But, it is useful and necessary for difficult and confusing subjects.'

4. Conclusion, Discussion and Implications

Student mathematics teachers reported regarding with PBL method that it could be used since it improves students' thinking skills and provides permanent learning, however the preparations and practice of this method was time consuming. While talking about the necessary characteristics of PBL scenarios, it was concluded that preparing such comprehensive problem scenarios was difficult and time consuming for teachers, after student teachers expressed that these problems could help to raise students as real problem solvers in their future lives by writing these problems with examples from their experiences outside the school and in a way that attract their attention. For their predictions regarding the effect of PBL on students, first of all, after stating that it would improve students' thinking skills, while some student teachers expressed that PBL would provide permanent learning and active participation to lessons and would attract their attention and interest to subject learned and searched, some of them expressed that it might force some of the students' learning. As a conclusion, most of the student teachers pointed out that they would definitely use PBL method when they were teaching by considering its time consuming character and the difficulties in writing scenarios.

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