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## **EFFECTS OF PROBLEM-BASED LEARNING APPROACH ON PROBLEM-SOLVING SKILLS AND COOPERATIVE WORKING ABILITY OF EIGHTH-GRADE STUDENTS**

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### **Abstract**

*The purposes of this research were 1) to study the problem-solving skills of students who were taught using problem-based learning approach between pre-study and post-study and 2) to compare the cooperative working ability of the students who were taught using problem-based learning approach and 3) to compare students' problem-solving skills with gain at 70%. The sample comprised 36 students of Navamindarajudis Matchim School, Muang District, Nakhon Sawan. The instruments used consisted of 4 teaching plans, a problem-solving skill test, and a cooperative working assessment form. The research was conducted for four weeks. The research design used was One-Group Pretest Posttest Design. The data were analyzed using t-test dependent.*

*The research findings:*

- 1. There was a significant increase in the problem-solving skills of the students at .05 after being taught using problem-based learning approach.*

2. *There was a significant increase in the cooperative working ability of the students at .05 after being taught by using problem-based learning approach.*

3. *There was a significant increase in students' problem-solving skills at 86.11% which was more than the gain of 70%.*

### **Keywords**

Problem-Based Learning, Problem Solving Skills, Cooperative Working Ability

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## **1. Introduction**

The current educational situation is focused on students development for a variety of skills to apply for their life. According to National Education Act B.E. 2542(1999) in Section 24, in organizing the learning process, educational institutions and agencies concerned shall: provide substance and arrange activities in line with the learners' interests and aptitudes, bearing in mind individual differences and provide training in thinking process, management, how to face various situations and application of knowledge for obviating and solving problems (National Education Act B.E. 2542(1999)). It can be seen that when students have gone through the learning process, they can use the knowledge learned to solve problems in daily life. Thus, solving problem skills are one of the skills that education law aims the age of 7-10 years students to accord to children developmental theories and they will have the ability to solve simple problems within limited scope. At the age of 11-15 years, they will have better thinking ability, thinking rationally and complex solving problems ability (Paiget,1962). In addition someone who has the ability to solve problems, is able to cope with the chaotic social conditions that everybody can solve the problem rightly (Chaiyrean, 2016). According to a rapidly changing world if someone can solve the problem properly in every situation, they can live together happily with others. (Sinthapanon, 2015)

Problem Based Learning (PBL) is a learning model that encourages and develops students in thinking to focus on understanding and solving problems. (Barrow and Tamblyn, 1980). This process provides the students with the ability to study their own needs and learning from coping that the problem is being in daily life. Then they find the solution to solve each problem (Gallagher, 1997) to accord with educational current management that it is important to develop the learner to have a variety of abilities, helps students learning, thinking skills and the process of solving problem (Khammani, 2011). In addition the aspect of the problem must

stimulate the interest of students, be open-ended problem to arise from the actual situation, encourage discussion, exchange of opinions and collaborate to solve problem using many ways (Duch, 1995, Allen, et al., 1996). According to the way of inquiry cycle method on discovering practice can integrate the knowledge into problem solving (Suebnukam and Haddawy, 2004).

The encouragement of student's problem solving skill and cooperative working ability as stated in the curriculum can be done through different ways and problem-based learning. This is a collaborative learning process in group which finds problem solving to success in collaboration and have interactions (Gallagher, 1997) to develop social skills and various learning (Sinpeng, 2010). The process helps the students to make efforts to learn, have the work in sub-group and group process analysis. It also develops social skills, ability to work and promote effective learning. (Khammani, 2011).

### **1.1 Research Objectives**

The principal objectives of the study were as follows.

1. To compare problem solving skills of students who learned using problem-based learning before and after learning.
2. To study the cooperative working ability of students before and after learning with problem-based learning.
3. To compare the problem solving skills of students after the learning process with a gain of 70%

### **1.2 Research hypothesis**

1. Students' problem solving skills after the learning is higher than before.
2. Students' cooperative working ability after the learning is higher than before

## **2. Research Methodology**

Research Design: One Group Pretest-posttest Design

Population: 480 students in eighth-grade of Navamindarajudis Matchim School

Sample: 36 students in eighth-grade of Navamindarajudis Matchim

School by sample random sampling

### **2.1 Research Procedures**

The procedures of learning management by using a problem-based approach will be discussed. It was used in a social studies subject on the topic "the Current Situations" which was

a 12-hour course. The mean of learning lessons was 4.43 (S.D.= 0.36). The result showed that it was highly appropriate. The procedures began with explaining learning activities step by step to students, followed by dividing the students into six groups for this study.

The participants did the test for measuring their problem solving skills of 5 situations as a pre-test. The Index of Item – Objective Congruence (IOC) between the test and content and the level of behavior was between 0.67 and 1.00. The Index of Difficulty (p) was between 0.40-0.60. The Discrimination (r) was between 0.42-0.47. The Reliability was 0.76. The evaluation form for the cooperative working ability (21 items) revealed that the IOC between the content and measured behavior was between 0.67 and 1.00. The Reliability was 0.89. These data were recorded as pre-test scores for further data analysis.

Next, the participants involved in the learning activities based on problem-based approach of this 12-hour course. The steps are as follows.

Step 1: Studying the problems. The participants needed to study the problems, including the causes of the problems and the effects of the problems. The problematic situations were unstructured. That is, the problems were not identified clearly.

Step 2: Finding the solutions. After they finished studying the problems, they had to find the solutions by searching for information from various sources.

Step 3: Selecting the solutions: The participants selected the best solution for the particular problem.

Step 4: Solving the problem. Each group created work or followed the way they selected which was different among groups.

Step 5: Evaluating the results of solving the problem. The participants evaluated the results of solving the problem, both individual and group levels. In addition, the teacher also evaluated the process of working together of each group.

After that, the participants did the test for measuring their problem solving skills a post-test and evaluated their cooperative working ability. Then, the scores of the tests and evaluation forms of pre-test and post-test were compared. Next, the data were statistically analyzed in order to test the hypotheses and draw conclusions.

## **2.2 Data Analysis**

1. Comparing the problem solving skills by drawing on the scores of the pre-test and post-test using t – test for dependent sample.

2. Study the cooperative working ability from the data obtained the evaluation forms (pre- and post- studies) using t – test for dependent sample.
3. Comparing the problem solving skills after study with the achievement criterion of 70% using t – test one sample.

### 3. Results

**Table 1:** Compare the problem solving skills with students in eighth-grade before and after learning by using Problem-Based Learning

Problem Solving Skills	n	$\bar{x}$	S.D.	t
Before learning	36	11.56	1.38	27.79*
After learning	36	22.32	1.25	

\*  $p < .05$

According to table 1, Students' problem solving skills after the learning process are higher than before with a statistical difference of .05

**Table 2:** Study the cooperative working ability with students in eighth-grade before and after learning by using Problem-Based Learning

Cooperative working ability	n	$\bar{x}$	S.D.	t
Before learning	36	59.22	8.75	6.72*
After learning	36	83.00	3.35	

\*  $p < .05$

According to table 2, Students' cooperative working ability after the learning process are higher than before with a statistical difference of .05

**Table 3:** Compare the problem solving skills after learning with students in eighth-grade by using Problem-Based learning to perform 70% of post-test

Problem Solving Skills	n	Criteria Students	$\bar{x}$	S.D.	Criteria Score	t
After learning	36	31(86.11%)	22.32	0.64	17.5	24.33*

\*  $p < .05$

According to table 3, Students' problem solving skill compared with the gain of 70% is higher than the stated gain. Their problem solving ability has a gain of 86.11% with is higher than the gain. This shows that the problem-based approach has a significant effect on students' problem solving.

#### **4. Conclusion**

The problem-based learning approach was design with learning activities encouraged students to participate in cooperative problem solving, Search for best ways and solutions to problem. After the learning process, Students' problem solving skills are higher than before with an increase of 86.11%. Equally students cooperative working ability after the experiment is higher than before. From experiment, the students give their opinions about the problem that they face and argue with the information which against to their learns. Then they find the conclusion within their groups when they present in the class for question about the doubt in the method of solving the problems by presenter explains about his study, so they understand together in the class that is in the line with research expectation.

#### **5. Discussion**

From the implementation of problem-based learning approach, students' problem-solving skills are better than before with an improvement in problem solving skills at the level of 86.11% higher than the normal gain at the level of 70% with a statistical significance of .05 which was in accordance with the stated hypothesis. This may be as a result of step-by-step organization of learning activities starting from studying the problem, collaborative search for ways to get solutions to problems, putting the solutions to practice, summarize and identify the direct solution to the problem. This is in line with Allen and Duch (1998) says that Problem solving approach where learners use problems to thing and develop their problem-solving skill. this makes the learners to learn to develop their own skills. And Gallagher (1997), says it is a learning process where learners work together by incorporating their old knowledge to new knowledge to understand a problem and search for solutions to these problems. This is in line with Phochen (2014), who conducted a research on enhancing problem-solving skills in mathematics and found that students had better problem-solving skills after leaning with the problem-solving approach at the significant level of 0.01.

From the evaluation of students' attitude, who learned using the problem-solving approach, student ability to works as a team is higher than before at a significant level of 0.05, which was in accordance with the stated assumptions. This is as a result of the organization of learning activities that enabled the students to work as a team. This is in accordance with Kemanee (2011), students should be given the opportunity to work in group and as a team during the learning process. Gallagher (1997) and Barkley, Cross, & Major (2004) suggest problem-based learning enhances student problem solving ability. According to Kemmani (2011), problem solving approach enablers students to exchange knowledge as well as help learners in the learning process, learners work together to analyze problems, plan together with the teachers as a facilitator in the learning process. According to Barrow and Tamblyn, (1980) when the learners work together, the teacher reduces the level of facilitation in order to enable the students work more independently to develop their problem-solving skills.

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