European Journal of Education Studies
ISSN: 2501 - 1111
ISSN-L: 2501 - 1111
Available on-line at: www.oapub.org/edu

doi: 10.5281/zenodo.401064 Volume 3 | Issue 4 | 2017

INSTRUCTIONAL APPROACHING MANAGEMENT THROUGH THE PROBLEM-BASED LEARNING MODEL FOR ENHANCING STUDENTS' LEARNING ACHIEVEMENTS AND THEIR SOLVING-PROBLEM ABILITIES TOWARD SCIENCE OF LOWER SECONDARY EDUCATIONAL STUDENTS AT THE 9TH GRADE LEVEL

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Abstract:
The purposes of this research study were to develop solving-problems in science learning approach with the *Problem-Based Learning* (PBL) instructional lesson plans to enhance students' learning achievements and their solving-problem abilities in science with the efficiency of the processing performances and the performance results (E_1/E_2) at the determining criteria as 80/80, students' learning achievements of their post assessing test and the criteria learning outcomes at 80% with the PBL, and students' solving-problem abilities and the criteria learning outcomes at 80% with the PBL toward science were compared, and to associate between students' learning achievements and their solving-problem abilities with the PBL was analyzed. Administrations with a sample size which consisted of 48 lower secondary educational students at the 9th grade level from Wapi Phatum School under the Maha Sarakham Secondary Educational Service Area Office 26 with the purposive sampling random technique was selected. Using the 6-main instructional PBL method's lesson plans to management of the activity-based learning conceptual approach in 12 hours, the 30-

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item *Learning Achievement Assessing Test* (LAAT), and the 20-item *Solving-Problem Ability Measuring Test* (SPAMT) were used. Statistically significant with the average mean scores, standard deviation, percentage, independent variable *t*-test were analyzed, simple and multiple correlations, standardized regression weight validity, and coefficient predictive value (R^2) were associated. The results of these research findings have revealed as: students were evaluated to determine performance criteria with the efficiency of the E_1/E_2 results with the PBL method indicated that of 85.48/84.44, which was higher than standardized criteria of 80/80. Students' learning achievements of their post assessing test and the scientific solving-problem learning ability outcomes at 80% with the PBL were differentiated that evidence at the 0.05 level, significantly. Students' performances of their SPAMT and the criteria learning outcomes at 80% with the PBL toward science were also found of statistically significant that evidence of 0.01, differently. Associations between students' learning outcomes of their LAAT and their SPAMT toward science, the R^2 value indicates that 67% of the variance in solving-problem abilities to their science class was attributable to their learning achievements of their Problem-Based Learning (PBL) instructional method toward science.

Keywords: instructional approaching management, the problem-based learning model enhancing students' achievements, solving-problem ability, science class

1. Introduction

Science teaching is very important in human life, because science involves everyone, both in daily life and in various occupations are attaching as well as technology, tools, appliances, and productivity. Human can be used to facilitate daily life and these works are the result of scientific knowledge that combines with creativity and other sciences. Science helps human beings develop their ways of thinking; the idea is rational, creativity critical thinking with their critical thinking, and critical thinking skills. Promote systematic problem solving in science is a culture of the modern world, a learning society for everyone needs, to be developed from science that it in order to have a better understanding of nature and human-made technology. The knowledge can be used creatively and have the ability to solve problems in various fields (Ministry of Education, 2008).

However, at this nowadays, science learning management is not as successful as it should due to the fact that most of science learning is still focused on the transfer of knowledge from teachers alone, rather than the students themselves. Panpruek (2013)

said that the results of the National Quality Educational Testing (O-NET) in the academic year 2015 of the Grade level at 12th of lower secondary educational students, which found that the science subjects had a total of 656,463 candidates nationwide, scoring an average of 37.63%, the highest score of 100, the lowest score of 0, which was considered to be very low. In addition, from the interview of teachers who teach in Wapi Phatum School under the Maha Sarakham Secondary Educational Service Area Office 26, Mahasarakham Province in Northeast Region of Thailand. It was found that the students' learning achievements who sat in this school have a lower academic achievement in science. There is a behavior that is less interested in learning in science and it is likely that the learning outcomes of science will be lower. (Ruangsombut: Interview. 2016).

Focused on the *Problem-based learning* (PBL) is a student-centered pedagogy in which students learn about a subject through the experience of solving an open-ended problem found in trigger material. The PBL process does not focus on problem solving with a defined solution, but it allows for the development of other desirable skills and attributes. This includes knowledge acquisition, enhanced group collaboration and communication. The PBL process was developed for medical education and has since been broadened in applications for other programs of learning. The process allows for learners to develop skills used for their future practice. It enhances critical appraisal, literature retrieval and encourages ongoing learning in a team environment.

The PBL tutorial process involves working in small groups of learners. Each student takes on a role within the group that may be formal or informal and the role often rotates. It is focused on the student's reflection and reasoning to construct their own learning. The Maastricht seven-jump process involves clarifying terms, defining problem(s), brainstorming, structuring and hypothesis, learning objectives, independent study and synthesis. In short, it is identifying what they already know, what they need to know, and how and where to access new information that may lead to the resolution of the problem. The role of the tutor is to facilitate learning by supporting, guiding, and monitoring the learning process (Schmidt, Rotgans, and Yew, 2011). The tutor must build students' confidence to take on the problem, and encourage the students, while also stretching their understanding. This process is based on constructivism. PBL represents a paradigm shift from traditional teaching and learning philosophy (Hung, 2011), which is more often lecture-based. The constructs for teaching PBL are very different from traditional classroom or lecture teaching and often requires more preparation time and resources to support small group learning.

Wood (2003) defines problem-based learning as a process that uses identified issues within a scenario to increase knowledge and understanding. The principles of this process are composed of learner-driven self-identified goals and outcomes, students do independent, self-directed study before returning to larger group, learning is done in small groups of 8–10 people, with a tutor to facilitate discussion, trigger materials such as paper-based clinical scenarios, lab data, photographs, articles or videos or patients (real or simulated) can be used, the Maastricht 7 jump process helps to guide the PBL tutorial process, based on principles of adult learning theory, all members of the group have a role to play, allows for knowledge acquisition through combined work and intellect, enhances teamwork and communication, problem-solving and encourages independent responsibility for shared learning - all essential skills for future practice, anyone can do it as long it is right depending on the given causes and scenario, teachers can be champions and holder of a vocational degrees, and it depends upon the cases and the scenario the building of curriculum lesson.

The *P^{5}BL Approach* was a learning strategy introduced in Stanford School of Engineering in their P^{5}BL laboratory in 1993 as an initiative to offer their graduate students from the engineering, architecture and construction disciplines to implement their skills in a "cross-disciplinary, collaborative and geographically distributed teamwork experience" (Fruchter and Lewis, 2003). In this approach, which was pioneered by Stanford Professor Fruchter, an environment across six universities from Europe, the United States and Japan along with a toolkit to capture and share project knowledge was developed (Melzner; Merz; and Bargstädt, 2015). The students (people) from the three disciplines were assigned a team project that works on solving a problem and delivering an end-product to a client.

The main stress of this approach is to have an inter-disciplinary integrated development of deliverables, in order to improve the overall competency and skills of the students. P^{5}BL mentoring is a structured activity that involves situated learning and constructivist learning strategies to foster the culture of practice that would extend beyond the university campus to real life. P^{5}BL is all about encouraging teaching and learning teamwork in the information age, by facilitating team interaction with professors, industry mentors and owners who provide necessary guidance and support for the learning activity.

Key advantages of this method are that it familiarizes students with real world problems and improves their confidence in solving these. It also improves their networking skills, thereby establishing rapport with key persons of the industry. They

also learn the value of teamwork. The method also creates in them an appreciation of interdisciplinary approach.

The approach however needs due consideration of the mentoring provided to the students. Appropriate scaffolding should be done by the mentors to ensure that students are successful in attaining their project goals to solve the problem. Communication between the team should also be open and constructive in nature for achieving the necessary milestones. So that, the problem-based learning management is a problem-oriented learning environment that is a tool to help learners achieve their learning goals. The instructor may give examples that face real problems in teaching and practice the problem analysis processing trouble shooting a group. The PBL will help students understand the problem clearly, to have seen a variety of ways to solve the problem. In addition, it helps students to develop their thinking skills and problem solving processes. (Kaemmanee, 2012) The problem-solving process is based on problem solving; understanding with problems; the stage of study; the synthesis of knowledge; the conclusion and evaluation of answers; and the presentation and evaluation of the work (Office of the Education Council. (2007).

Based on relevant research, it is found that problem-based learning enables students to be more capable of solving problems of learning and daily living (Promkate, 2013). Students' responses of their PBL instructional management were higher in science learning achievement, higher academic communication skills, and higher post-graduate thinking skills (Chittapak, 2005). The PBL can also be promoted and they can further enhance science learning behaviors and attitudes towards science (Koatsingh, 2012).

From as above researcher team was interested in using the learning process using problem-based models. This is another appropriate and effective teaching style to help students solve problems from various situations that bring knowledge from the solution to daily life was used. The researcher team believes that the instructional management of problem-based learning method in science can develop the solution to the problems that arise and can help to enhance the student's academic achievement.

2. Methodology

Although students generally like and gain greater ability to solve real-life problems in problem-based learning courses, science teacher of the methodology must often invest more time to assess student learning and prepare course materials, as compared to LBL science teacher**.** The problem of the problem-based learning is the traditional

assumptions of the students. Most of the students might have spent their previous years of education assuming their teacher as the main disseminator of knowledge. Because of this understanding towards the subject matter students may lack the ability to simply wonder about something in the initial years of problem-based learning. The science teachers have to change their traditional teaching methodologies in order to incorporate problem-based learning. Their task is to question students' knowledge, beliefs, give only hints to correct their mistakes and guide the students in their research. All these features of problem-based learning may be foreign to some science teacher; hence, they find it difficult to alter their past habits. The science teachers have to adapt new assessment methods to evaluate the pupils' achievement. They have to incorporate written examinations with modified essay questions, practical examinations, peer and self-assessments etc. Project-based learning is one of the effective ways of delivering education. It has several advantages over traditional methods but at the same time few disadvantages. When we see in comparison with the traditional method the students from project based learning curriculum seem to have better knowledge retention and it also provides interesting and challenging educational atmosphere to students. Therefore, the beneficial effects of project based learning should not be underestimated. It can make students' learning experience very interesting and give students very fascinating or enthralling of this research methodology.

3. Research Aims

1. To develop solving-problems in science learning approach with the *Problem-Based Learning* (PBL) instructional lesson plans to enhance students' learning achievements and their solving-problem abilities in science of lower secondary educational students at the 9th grade level with the efficiency of the processing performances and the performance results (E_1/E_2) at the determining criteria as 80/80.
2. To compare between students' learning achievements of their post assessing test and the criteria learning outcomes at 80% with the *Problem-Based Learning* (PBL) instructional method.
3. To compare between students' solving-problem abilities and the criteria learning outcomes at 80% with the *Problem-Based Learning* (PBL) instructional method toward science.

4. To associate between students' learning achievements and their solving-problem abilities with the Problem-based learning (PBL) instructional method toward science.

4. Research Procedures

This research study is an experimental research that using the problem-based learning management on the promotion of students' learning achievement and their abilities to solve scientific problems of the lower secondary educational students at the grade 8th level in 3 phases that each phase was followed as:

4.1 The First Phase: Creating and Testing Quality Research Instruments

A. The Innovation of the Learning Management Instructional Lesson Plans

Using the problem-based learning model has an average quality value 4.74 at a high level, the learning management plans are quality and can be managed were assessed from the 5-professional educating experts.

B. The Learning Achievement Assessing Test (LAAT)

Students were evaluated with the Learning Achievement Assessing Test (LAAT) on the Life and Ecology Environment and Natural Resources issue. The LAAT obtained of the 30-item multiple choice test was used to measure students" learning achievements of their pretest and posttest designed with their PBL instructional activities. An issue of the context variety of ecosystems, relationships between ecosystem organisms, ecological energy transfer ecological circulation population in the ecosystem in six of innovative learning management lesson plans was analyzed. Using the internal consistency Cronbrach alpha reliability was assessed and the α-reliability have a consistency value ranged from 0.60 to1.00 with discriminative power ranging from 0.28 to 0.62, and the difficulty level ranges from 0.36 to 0.62. The α-reliability of the whole test ranged from 0.62 to 0.81, responsibility.

C. The Test of Problem-Solving Ability for Scientific Problem (TPSASP)

The Test of Problem-Solving Ability for Scientific Problem (TPSASP) was a multiple choice quiz. There are four options for answering 20 choices, which classify the problem of solving scientific problems. The 4 steps include step-by-step trouble shooting, problem solving, problem solving, and check the results with a consistency was ranged from 0.67 to 1.00.

4.2 The Second Phase: Data Collection

The type of this research study was designed with a research model that it was a single group; *One-shot Case Study*: students were administered with the instruction according to the innovative instructional lesson plans. Researcher team was measured or post-experimental observation by data collection that the information follows as:

1. The instructor conducts learning activities in a form of problem-based learning model with the 6-innovative lesson plans on Life and Ecology Environment and Natural Resources Issue for 12 hours, 3 hours per week, and the total as 4 weeks.
2. Students were assessed with the *Learning Achievement Assessing Test* (LAAT) to measure learning achievement after learning management using the problem-based model as a multiple choice for the 30-item was evaluated.
3. Students were assessed with the 20-item *Test of Problem-Solving Ability for Scientific Problem* (TPSASP) was a multiple choice to measure the abilities to their thinking scientific problems later their learning management with the PBL model was used. This was a test of the situation based on the solution of the problem of four steps: Step 1: to identify the problem; Step 2: to analyze the problem; Step 3: to propose a solution; and Step 4: to check the results. This is a multiple choice test as 4 options, and 5 scenarios.
4. To associate between students' learning achievements and of their post assessing test and the scientific solving-problem learning ability outcomes at 80% with the PBL instructional processes.
5. The collecting data were analyzed that the results according to statistical methods.

4.3 The Third Phase: Data Analysis

This research study was used of data analysis with software packages, which following the steps as below:

1. To analyze the effectiveness of the innovative learning management lesson plans, using a problem-based learning model for assessing the PBL model with the efficiency of the process and the efficiency of the results (E1/E2) defined by the standardized criteria of 80/80.
2. Comparisons between students' learning achievements of their later instruction with the PBL model and their percentage criterion of 80% with the mean scores, standard deviation, and independent variable *t*-test were analyzed.
3. To compare between students' performances of their scientific solving-problem abilities of their later instruction with the PBL model and their percentage

criterion of 80% with the mean scores, standard deviation, and independent variable t-test were associated.

4. Associations between students' learning achievements and their scientific solving-problem abilities toward science with the PBL model in cording to the simple and multiple correlations, and the coefficient predictive value (R^2).

4.4 Research Instruments

The introduction to problem-based learning model would give an overview of problem-based learning by answering some of the questions, which researcher team often asked when facilitating PBL staff development initiatives were the main purpose study. It aims to encourage researchers to explore the idea of using or not using PBL in instructor teaching. It highlights areas of research who may be interested in considering these research instruments were used that composed of the *6-Innovation of the Learning Management Instructional Lesson Plans,* the 30-item *Learning Achievement Assessing Test* (LAAT), and the 20-item *Test of Problem-Solving Ability for Scientific Problem* (TPSASP).

4.5 Sample

The target group was consisted of 48 lower secondary educational students at the 9th grade level from Wapi Phatum School under the Maha Sarakham Secondary Educational Service Area Office 26 with the purposive sampling random technique was selected.

5. Results

Because of the Problem-Based Learning Model has been the one of the most important recent developments in this research study in secondary level after it used to study at the university educational level. It started with medical education in North America and has spread across the globe and across most disciplines. Its potential to develop student learning has not been exploited in higher education. Students report that problem-based learning is fun. So, this is the target purpose with the Problem-Based Learning Model (PBL) was selected.

5.1 The Processing Performances and the Performance Results (E_1/E_2)

To develop solving-problems in science learning approach with the *Problem-Based Learning* (PBL) instructional lesson plans to enhance students' learning achievements and their solving-problem abilities in science of lower secondary educational students

at the 9th grade level with the efficiency of the processing performances and the performance results (E_1/E_2) at the determining criteria as 80/80. This result shows the statistically significant in Table 1.

Table 1: The Mean, Standard Deviation, Percentage, Total Score for the Efficiency of the Processing Performances and the Performance Results (E_1/E_2) of the PBL Model

Efficiency Types	Total Score	Students' Number	Mean	S.D.	Percentage
Efficiency of the Processing Performances (E1)	170	48	145.31	5.05	85.48
Efficiency of the Performance Results (E2)	30	48	25.33	2.44	84.44
Efficiency of the Innovative Learning Activity Plan (E1 / E2) = 85.48 / 84.44					

Table 1 reports of the effectiveness of the problem-based learning management innovative lesson plans on Life with Ecology and the Environmental and the Natural Resources Issue in science class of the 48-lower secondary educational students at the 9th grade level with the PBL instructional model were responded with the efficiency of the processing performances and the performance results (E_1/E_2) indicated that evidence of 85.48 / 84.44, which was higher than with the criteria of 80/80.

5.2 Comparisons between Students' Learning Achievements of their Post Assessing Test and the Criteria Learning Outcomes at 80% with the *Problem-Based Learning* (PBL) Instructional Model

Using the average mean scores of students' learning achievements of their post assessing test and the criteria learning outcomes at 80% with the *Problem-Based Learning* (PBL) instructional model were analyzed. Table 2 shows the result of this research study.

Table 2: The Mean, Standard Deviation, Total Score, the Criteria Score of 80%, Mean Different, and Independent Variable t-test for the PBL Model

Students' Number	Total Score	Criteria Score 80%	Mean	S.D.	df	t-test	Sig. (p)
48	30	24	25.33	2.44	47	3.78	.000

In Table 2, it was found that the comparisons of mean scores on students' learning achievements later learning management using the PBL formulation as the basis of life and ecology, and environment and natural resources issue of lower secondary educational students at the 8th grade level with 80% of the 48 students, using the 30-item *Learning Achievement Assessing Test* (LAAT) as 5 multiple choice, it was found that the mean scores of post-course achievement were 25.33, the standard deviation was 2.44

when analyzing the difference using t-test statistics (One-Way ANOVA), it was found that the t-test indicated that was 3.78 and statistically significant at the level of .001, differently.

5.3 Comparisons between Students' Solving-Problem Abilities and the Criteria Learning Outcomes at 80% with the *Problem-Based Learning* (PBL) Instructional Method toward Science

The result of this research section would be reported of students' solving-problem abilities and the criteria learning outcomes at 80% with the *Problem-Based Learning* (PBL) instructional method toward science were compared. Using the 20-item *Test of Problem-Solving Ability for Scientific Problem* (TPSASP) was administered.

Table 2: The Mean, Standard Deviation, Total Score, the Criteria Score of 80%, Mean Different, and Independent Variable t-test for the PBL Model

Students' Number	Total Score	Criteria Score 80%	Mean	S.D.	df	t-test	Sig. (p)
48	20	16	16.77	1.38	47	3.85	.000

Table 3 reveals that the differences between students' solving-problem abilities and the criteria learning outcomes at 80% of the PBL model were significant at the 0.001 level.

5.4 Associations between Students' Learning Achievements and their Solving-Problem Abilities with the Problem-Based Learning (PBL) Instructional Method toward Science

In this study, it was also considered important to investigate associations between students' learning achievements and their solving-problem abilities with their Problem-Based Learning (PBL) instructional method toward science. The selection of an evaluation and assessment suitable for answering the fourth research aim was required. This suggests that the associations between mean scores of the 30-item *Learning Achievement Assessing Test* (LAAT) and the 20-item *Test of Problem-Solving Ability for Scientific Problem* (TPSASP) in science class.

Table 4: Associations between the LAAT and the TPSASP in Science Class in Terms of Simple Correlation (r), Multiple Correlation (R), Standardized Regression Weight Validity (β), and Coefficient Predictive Value (R^2) of the PBL Instructional Model

Variable	Mean (100 Scoring Mean)	S.D.	Simple Correlation (r)	Standardized Regression Weight Validity (β)	Multiple Correlation (R)	Coefficient Predictive Value (R^2)
LAAT	84.44	8.15	0.70***	0.82***	0.8199***	0.6722***
TPSASP	83.85	6.94				

N = 48, *ρ<0.05, **ρ<0.01, ***ρ<0.001

Two main methods of data analysis were used to investigate this solving-problem ability relationship. This involved: simple correlational analysis (r) of relationships between students' learning achievements and their solving-problem abilities with their Problem-Based Learning (PBL) instructional method toward science; and multiple correlation (R) between the set of the LAAT and the TPSASP. The result of this analysis reveals that; simple correlation (r), which show statistically significant correlations (*ρ<0.001*), the standardized regression weight validity (β) which measures the associations students' learning performances with the LAAT and the TPSASP toward science when the effect of relationships is controlled. The multiple correlation (R) is significant for the LAAT and the TPSASP and shows that when these research instruments are considered together there is significant (*ρ<0.001*). The R^2 value indicates that 67% of the variance in solving-problem abilities to their science class was attributable to their learning achievements of their Problem-Based Learning (PBL) instructional method toward science.

6. Discussions

This research study was to investigate of the instructional approaching management through the Problem-Based Learning Model for enhancing students' learning achievements and their solving-problem abilities toward science of lower secondary educational students at the 9th grade level are discussed the results that followed as:

The numbers given of E1/E2 are determined by the researcher team, it must include the following elements: the nature of the course or the difficulty content of the course or content. If it is high level, because the students may be able to pass easily, if the content is difficult to set a little bit, such as mathematics will set about 70/70 or 75/75, because the nature of the subject itself. The competency of the learners who are there in school, there are a lot of good students. The efficiency of this media must be

able to raise the knowledge to close to 100 as much as possible with it. The E1 is the efficiency of the process; the process is the process of teaching and learning between all classes. For example, 80 is for all students to do the exercises or sub-tests with an average score of 80%, which is derived from the formula. The sum of the scores divided by the total number of students multiplied by 100 and then divided by the total I of the full marks of the series will be E1.

In terms of the E2, it is the performance of the result is to later the learner has finished the process by grades after class for the sum of the scores divided by the total number of students multiplied by 100, which combine the full score of the quiz after E2. In this research study, the efficiency of process and result (E1/E2/ is 85.48/84.44, which is higher than the set criterion of 80/80, average mean scores that the learners from the quiz and the group workbook of 6 sets of 85.48% and the average score from the test after the achievement test of 84.44% that were in accordance with the objectives of the research. This may be due to the management of learning on life science and ecology, the environmental and natural resources for lower educational students at the 8th grade level using the PBL model were developed by the researcher team has been properly built. Based on the basic principles of the Basic Education Core Curriculum AD 2008, which following the principle of the Problem-Based Learning model was administered. Focused on learners is important. Organize learning activities for learners seeking knowledge creation; self-knowledge; various measurements and assessments are made according to actual conditions. It is acceptable that the learner achieves learning outcomes based on the goals set. This corresponds to the research results of Ploysang (2010) who studied of the first year students at Mahachulalongkorn University, with using the problem-based model. The research found that the effective learning management according to criteria of the percentage was 86.00/85.56.

To compare between students' learning achievements of their post assessing test and their criteria learning outcomes at 80% with the Problem-Based Learning (PBL) instructional method. The post-instructional learning achievement using problem-based models was higher than the statistically significant criterion of .05, which is in line with the research of Kanyama (2013) studied on problem-based learning with food and subsistence. The students' learning achievement and the ability to solve scientific problems were used in the research. After being taught by problem-based learning, the learning achievement was higher than before using problem-based learning management at the .05 level of significance. Due to the use of problem-based learning activities, it is a learning process in which learners build knowledge from a problem or situation that is of interest to the student's daily life that the student may encounter

through the process, group work searching for a process to understand and solve a problem by reason. The problem is related to real life and starting point of the learning process. It also stimulates the development of problem-solving skills by focusing on learners' decision-making in self-study and collaborative learning within the learner group. In accordance with the research results with Intanont (2008), the studied of science learning achievement and science problem solving ability of the 9th grade level's students by random cluster (Cluster Random Sampling) class of 40 students in two groups of the experimental group was taught to use problem-based learning and control groups that were taught to learn the knowledge-seeking paradigms. The research found that students who have been dealt with problem-based learning with students who have been taught through inquiry-based learning, there was a statistically significant difference at the .01 level.

In terms of comparisons between students' solving-problem abilities and the criteria learning outcomes at 80% with the Problem-Based Learning (PBL) instructional method toward science was assessed. Ploysang (2010) reported on his study of language learning achievement and communication among the first year students at Mahachulalongkornrajavidyalaya University, in academic year 2010, using the problem-based model. The research found that language learning achievement and problem-based learning communication. There was an average score of the achievement test on language learning and problem-based learning communication at 20.20, or 67.33%, from the 30-point scale and the average score from the achievement test. The post-test scores were 25.67, or 85.56 percent, respectively, from the 30th percentile. The t-statistic was found to be higher in teaching and learning outcomes of their previous studying at the statistical significance level of .05. Koatsingh (2014) measured of the ability to solve scientific problems was 86.67 percent, which meets 80 percent of the full score compared to the specified criteria. Corresponding to develop of problem-based teaching styles for developing problem solving skills with a sample size of 24 students at the 7th grade level was used. The students' average score on posttest problem solving skills was higher than before using the problem-based teaching style at the .05 level. This was consistent with the research study of Loapaisalapong (2011), the ability to think and solve problems with a sample size of 64 students were randomly assigned to 32 experimental groups and 32 control groups. The experimental group taught using the problem-solving and control-based learning management method in 50 minutes use the same content in both groups. The experiment was conducted using Randomized Control Group Pretest - Posttest Design. The experimental group's ability to solve problems was significantly different at the .01 level.

Associations between students' learning achievements and their solving-problem abilities with the Problem-based learning (PBL) instructional method toward science were assessed. The aim of this critical review of this research study is to explore the research supporting the effectiveness of problem-based learning (PBL) as a teaching method in dental education. PBL was developed more than 40 years ago in reaction to the problems and limitations of traditional teaching approaches. Here, aspects of the PBL teaching approach are reviewed, and the reasons for the substantial effect of this approach on dental education are discussed. Evidence shows that students in PBL-based courses exhibit superior professional skills and effective learning compared with those instructed using traditional approaches were associated. The simple correlation values (r) are showed significant correlations ($p<0.001$). The multiple correlation R was significant for the LAAT and the TPSASP. The result of this analysis reveals that; simple correlation (r), which show statistically significant correlations ($\varrho<0.001$), the standardized regression weight validity (β) which measures the associations students' learning performances with the LAAT and the TPSASP toward science when the effect of relationships is controlled. The multiple correlation (R) was significant for the LAAT and the TPSASP and showed that when these research instruments are considered together there is significant ($\varrho<0.001$). The R2 value indicates that 67% of the variance in solving-problem abilities to their science class was attributable to their learning achievements of their Problem-Based Learning (PBL) instructional method toward science. In addition, suggestions that the instructional approaching management through the Problem-Based Learning Model for enhancing students' learning achievements and their solving-problem abilities toward science of lower secondary educational students at the 9th grade level are provided.

7. Suggestions

7.1 Suggestions for Teachers

At the time of conducting research, problem-based learning management has found problems in teaching and learning activities.

1. In conducting instructional activities using a problem-based model in the process of defining the problem, the teacher must plan the tightness; define scope of observation for solving the problem from a concise and concise situation so that the learner is not mislead.

2. Learning activities in a limited time study period, teachers must be prepared to source resources and should focus on the scientific process skills, working group skills.
3. Using the learning activities and learning materials should be diversified to stimulate and stimulate student interest. It should be adapted to teaching procedures that use problem-based forms, such as using the internet to teach and opening videos related to the problem, etc.
4. Duration of appropriate students' activities should be adjusted to a 3-hour plan. It will be time to take the 6 step effectively. Each stage should be flexible in accordance with the situation and learning conditions of students at that time, including teachers should closely supervise students.

7.2 Suggestions for the Next Research Study

1. Teachers may study the effect of using the teaching model as a problem-based model for classroom management, such as; elementary education, critical thinking process skills, creative thinking skills, and decision-making process skills. The research process skills and problem solving skills enable students to continuously improving their learning;
2. The teachers or researchers may study the effect of using the science teaching model using the problem-based model to integrate with other subjects, such as; social studies, religion and culture, mathematics, and etc.

Acknowledgement

We are grateful to our 48-students who sat at the 9th grade level from Wapi Phatum School under the Maha Sarakham Secondary Educational Service Area Office 26, that have provided us through moral and emotional support in our research study. We are also grateful to our other family members and friends who have supported me along the way.

With a special mention to Prof. Panwilai Chomchid, Dr. Panadda Thansupho, in general, it was fantastic to have the opportunity to work majority of our research in our facilities. What a cracking place to work!

We are also grateful to the following university staff: Prof. Dr. Toansakul Santiboon, Prof. Panwilai Chomchid, and our colleagues; Master of Science Educational students for their unfailing support and assistance the M.Ed. research. And finally, last but by no means least; also to everyone in the impact hub… it was great sharing laboratory with all of us during last two years.

Thanks for all your encouragement!

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