

The Results of the Problem Solving of Nakhon Si Thammarat Rajabhat University's Undergraduate Students after Study with Problem Based Learning in Design and Development of Applications for Mobile Devices Subject

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Abstract

The purposes of the research were: 1) Study the knowledge about Design and development of applications for mobile devices 2) Study the problem solving ability of students and 3) Study the attitude of students towards learning management by problems based learning . The Research samples were 30 students studied in Design and development of applications for mobile sevice subject of academic year 2018 by using Purposive Sampling method. The statistics used in the research were mean and standard deviation.

The result of the research were as follows: 1) The students by using problem-based learning have knowledge higher than criterion. 2) Problem solving ability from total students has an average of 4.14 at an excellent level. and 3) The attitudes of students by using problem based learning was good level by the highest level of self development of learners, second was the roles of teacher and the last was the learning process by problem based learning

Keywords: Problem based learning, Problem solving ability, Attitudes, Application

Introduction

Learning Reform in accordance with the National Education Act (4th edition) B.E. 2562, with a focus on research and innovation. For the development of the country to keep up with global changes consistent with the 12th National Economic and Social Development Plan, focusing on the development of children and youth to be good, intelligent, knowledgeable and able to be the future of the nation Thai youth will know about self-reliance. Have basic skills in science, technology, engineering, mathematics, art and foreign languages. Can learn continuously by yourself. (Office of the National Economic and Social Development Board, 2019) National development in a holistic and sustainable way therefore includes systematic education reform, reform of the learning process for the entire society. Providing the majority of people with opportunities to learn life skills and skills to earn a living effectively. Resulting in intelligence in all aspects, including emotions, intelligence, problem solving, and awareness of working together. (Chiangkul W., 2007)

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In addition, the vision of the educational reform in the second decade (2009-2018) stipulates that "Thai people can learn throughout their lives with quality" with the focus on 3 reforms, which are 1)improving the quality of education and learning 2) Educational opportunities, Provide opportunities for Thais to access quality learning. 3) Participation from all sectors of society. The quality of education and learning must achieve 4 qualities which are 1) Quality of modern Thai people 2) Quality of modern teachers 3) Quality of learning sources / modern school 4) Quality of new management. The goals of the educational reform strategy in the second decade are as follows: 1) Thai people and Thai education have international quality and standards. 2) Thai people are curious: able to learn by themselves. Love to read and seek knowledge. 3) Thai people are good-minded: have basic morals, have a conscience and desirable values See the common interests, have public mind, and have a democratic culture. 4) Thai people think of how to solve problems, have skills to think and act, have the ability to solve problems, creative, have the ability to compete.

Learning management in the 21st century focuses on the development of students to be able to seek knowledge by themselves. Focusing on self-knowledge creation from various learning resources. In which students will be able to integrate their knowledge with learning and innovation skills, Information skills, Media and technology. And life and career skills (Panit W., 2013) From the past to the present, there are many learning theories. One of the popular and consistent learning theories in the 21st century is creative doctrine. (Constructivist Learning Theory) that believes that learning occurs when students create their own knowledge, combining from previous knowledge and new knowledge (Makmee P., 2011). From this theory of learning, there is a learning management model that focuses on allowing students to participate in learning more than previous learning styles, such as cooperative learning, Learning styles to help each other, Independent learning styles, including problem-based learning styles which is an interesting learning model, which can be seen from many relevant researches.

Learning based management is to use problems as a starting point for learning, in which the teacher must prepare problems for students to practice by studying the problem, together think critically and finding more knowledge. Then understand to be able to answer the problem and summarize knowledge from that problem. The main characteristics of problem-based learning are letting students be the center of learning. There is a group of learners. Use problems as a stimulus for learning. The instructor is waiting to give advice. Solve a problem. and provide learning resources or suggest search sources. Learners are self-problem solvers and the evaluation will be assessed from the actual situation and the results of learning. (Suwanno P., 2015)

Bachelor of Science Program in teaching, Department of Computer Technology and Digital Industry. There are courses in designing and developing applications for mobile devices. That students must register in the said course. In the course, the main content of the course is

software system analysis and design. In which students will use real problems in their daily lives to analyze and design. The steps are carried out according to the sequence of software development. The design of the display screen on a mobile device has different sizes. And teaching and learning about content development

The researcher therefore has the idea of developing a learning model by using information technology together with teaching and learning by using problem based learning. Which is to develop students to develop critical thinking and problem solving skills by self practice. Resulting in learning which can research understand the content. This learning management model will focus on using a variety of digital technology media today as tools for each step of learning. Which will help motivate students to be interested freedom to learn from various sources, which will help motivate students to be interested. Freedom to learn from various sources which will help students to have better academic achievement. In which the researcher used the experimental research model (Experimental research) conducted experiments using a single group format. Test knowledge of Design and application development for mobile devices. After learning by using the problem as the base against the set criteria. The problem solving ability of the students was studied after receiving problems based learning. And in addition, studying the student's attitude towards learning management by problems based learning.

Objectives

1. To study knowledge of Design and development of applications for mobile devices after learning by problem based learning against the set criteria.
2. To study the problem solving ability of students after receiving problem based learning.
3. To study the attitude of students towards learning management by problems based learning.

Methods

Population and sample

The population used in this research is the first year students in Computer Technology and Digital Industry Program. Faculty of Industrial Technology at Nakhon Si Thammarat Rajabhat University. In Design and development of applications for mobile devices subject for the second semester of the academic year 2018, consisting of 30 peoples.

The sample used in this research is the first year students in Computer Technology and Digital Industry Program. Faculty of Industrial Technology at Nakhon Si Thammarat Rajabhat University. In Design and development of applications for mobile devices subject for the second semester of the academic year 2018, consisting of 30 people by using the population as a sample.

Instruments

The Instruments used in this research were

1. Problem based learning management plans in the course of Design and development of mobile applications devices for 16 weeks, 4 periods per week in accordance with the standard qualifications framework.

2. Test of knowledge of Design and application development for mobile devices look like a 5 choice question.

3. Problem solving ability test of students is a rating scale of 5 levels with dimensions to measure the ability to solve problems in 4 aspects, including

3.1 Ability to determine problems

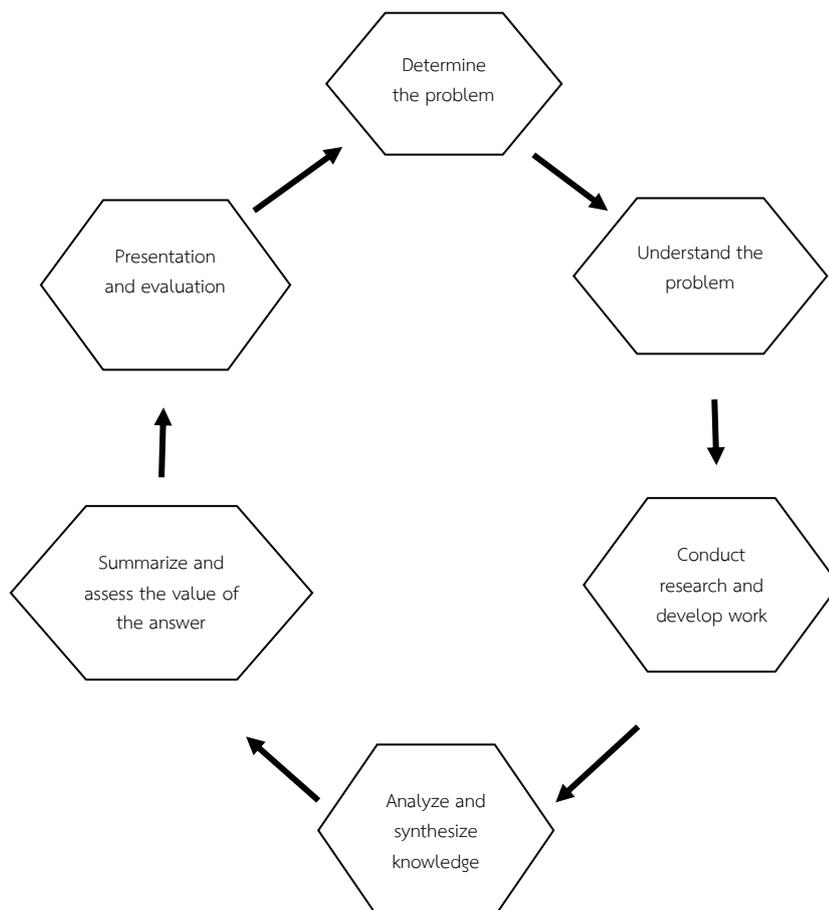
3.2 Ability to analyze problems

3.3 The ability to propose a solution

3.4 The ability to analyze results from problem solving

4. The attitude toward learning management by problems based learning in the Design and application development for mobile devices subject is characterized by 5 rating scales of 15 items.

Research procedure



Figures 1. Step of problem based learning management
(Eastern Asia University Research Office, 2010)

Step 1 : Determine the problem

1.1 The lecturer gives an example using the connection points from problems that occur in daily life. Have students practice analyzing the problem and the solution by using the software development process. Which is the content of instruction learning unit on system analysis and design.

1.2 Divide students into groups of 4 people each, based on the students learning about System analysis and design according to the System Development Life Cycle (SDLC), students are given examples of real problems in everyday life. That can bring software to solve problems as well as writing as a proposal for the group project

Step 2 : Understand the problem

2.1 Organize students into groups of 4 people each.

2.2 Have students in each group understand the problem. By having students specify that the solution to the problem from the project proposal is specified by the student. It is necessary to study knowledge about solutions to problems. Boundary order of software development process with flowchart. Screen design and how to use the software.

2.3 Have each group of students determine the scope of their application development. 2.4 Have each group present a project organized by their own group. With professors and students jointly providing additional suggestions to make the project more complete

Step 3: Conduct research and develop work systems

3.1 The lecturer lectures in the course. Regarding the process of application development for application development. The lecturer provide important resources for students to learn more from the teaching materials and related textbooks. Define problems for students to practice each week. Which is in the course of the unit learning about application development on the Android operating system.

3.2 Students jointly study, Define issues that need to be researched, Content analysis importantly to find the answer to the problem set by the teacher in a week. And apply knowledge to further develop the application according to the proposed project proposal

3.3 Have students proceed with application development as per the project proposal with the AppInventor 2 program and test the application on a real smartphone.

Step 4 : Analyze and synthesize knowledge

After each group of students went to develop applications from problems encountered in daily life. Students must collaborate, analyze, synthesize, discuss together. And exchanging knowledge that has been studied and researched to be correct or not in order to find the conclusion in the next step.

Step 5 : Summarize and assess the value of the answer

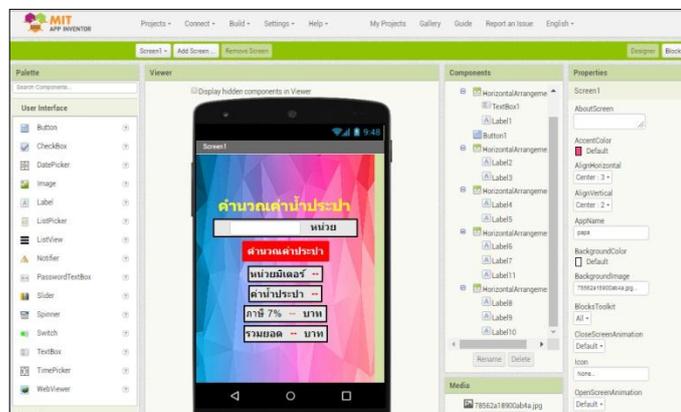
Each group of students summarized their own work. Answering problems that arise from application development. Designed to make presentations easy to understand. Together

propose that the analysis. Design and develop applications that are accurate, relevant, and appropriate. Try to examine concepts within the group freely and summarize the knowledge in the overview of the problem again.

Step 6 : Presentation and evaluation

6.1 Have students present with PowerPoint in the last week of the course. From the system that has been studied and developed according to the system development cycle. Analysis of solutions to problems and the result of the application being used in the trial.

6.2 Have all groups of students collaborate to evaluate the design and development of mobile software and summarize recommendations for other groups together with the lecturer.



Figures 2. Applications that students develop from problems

Statistics used in the research

1. A study of the knowledge of Design and application development for mobile devices after learning by problems based learning against the specified criteria. Analyzed by using basic statistics such as mean and standard deviation.

2. Study the problem solving ability of students after receiving problem based learning Analyzed by using basic statistics such as mean and standard deviation.

3. A study of student attitudes towards learning management by problem based learning in Design and developing applications for mobile devices. Analyzed by using basic statistics such as mean and standard deviation.

Results

1. A study of Design knowledge and Application Development for Mobile Devices After learning by using the problem as the base against the set criteria

The lecturer conducted a test to assess the knowledge of the students. In the last week of teaching and learning, second semester, academic year 2018, the test created by the

lecturer has a full score of 30 points. The lecturer determines the minimum criteria that students must receive is 24 points. The results appear as in Table 1.

Table 1 The results of the comparison of knowledge scores in Design and application development for mobile devices with the specified criteria.

Knowledge of Design and application development for mobile devices (Number of students 30 peoples)	Nominal criteria = 24 points	
	\bar{x}	S.D.
	25.27	2.02

From Table 1, it is found that the students' s knowledge of In Design and developing applications for mobile devices has an average value of 25.27, the standard deviation of 2.02, and the comparison of the differences between the knowledge scores in the Design and development of applications for mobile devices moving with specified criteria found that the scores were higher than the specified criteria.

2. Study the problem solving ability of students after receiving problem based learning.

The lecturer assessed the students's problem solving ability. After learning management by problems based learning. By using the test which the lecturer created. Results appear as in Table 2.

Table 2 Examines the problem solving ability of students after receiving problem based learning.

List	\bar{x}	S.D.	Quality Level
1. Ability to determine problems	4.30	0.65	Excellent
2. Ability to analyze problems	3.87	0.82	Good
3. The ability to propose a solution	3.93	0.74	Good
4. The ability to analyze results from problem solving	4.47	0.57	Excellent
Total	4.14	0.69	Excellent

From Table 2, It is found that the problem solving ability of the students in the overall is ezcellent ($\bar{x} = 4.14$, S.D. = 0.69). The ability to analyze results from problem solving has the highest mean at a excellent level ($\bar{x} = 4.47$, S.D. = 0.56) and the ability to analyze problems had the lowest mean at a good level ($\bar{x} = 3.87$, S.D. = 0.80)

3. Study the students' s attitudes towards learning management by using problem based learning.

The researcher studied the attitudes of the students in 3 areas which were the attitude towards the learning process by using problems based learning, self development of learners and in the role of the teacher. The study results are shown in Table 3.

Table 3 Results of the study of student attitudes towards learning management by using problems based learning in the course of Designing and developing applications for mobile devices.

List	\bar{x}	S.D.	Quality Level
In the learning process by using problem based learning.			
1. The learning process attracts attention in learning.	4.33	0.66	Good
2. Learning management has tricky steps.	4.07	0.91	Good
3. The learning process makes you feel bored.	2.57	0.94	Low
4. The learning process causes thought thinking.	4.13	0.78	Good
5. The learning process helps to understand the lesson.	4.27	0.87	Good
Total	3.87	0.83	Medium
Self development of learners.			
6. There is more learning planning.	4.47	0.63	Good
7. There is development of thinking.	4.43	0.68	Good
8. Developing working with others.	4.23	0.82	Good
9. Interested in studying.	4.27	0.58	Good
10. There is development of courage in offering Opinions.	4.30	0.70	Good
Total	4.34	0.68	Good
In the role of the teacher.			
11. The instructor gave useful suggestions.	4.37	0.76	Good
12. Asking teachers' s questions can stimulate thought.	4.27	0.64	Good
13. The instructor designed the situation in accordance with the course.	4.33	0.61	Good
14. The instructor designed the learning management in a clear hierarchy.	4.13	0.86	Good
15. Instructors focus on lecture teaching.	4.17	0.75	Good
Total	4.25	0.72	Good

From Table 3., It is found that the attitudes towards learning management by using problems based learning design and developing applications for mobile devices, in all aspects, in 3 aspects, at a high level in the aspect of self development of learners. The highest average ($\bar{x} = 4.34$, $SD = 0.68$) at a good level. Next is the role of the researcher ($\bar{x} = 4.25$, $SD = 0.72$) at a good level and the learning process by using problem based learning with the lowest mean ($\bar{x} = 3.87$, $SD = 0.83$) is at a medium level.

Discussion

From the study of Design and developing applications for mobile devices after learning by using the problem based learning against the set criteria. It was found that the comparison of differences between the knowledge scores in Design and developing applications for mobile devices scores were higher than the specified criteria. Because before learning management by using problem based learning, the researcher provided knowledge about software analysis and design. And in the learning management process by using problem based learning, undergraduate students will analyze the actual problems in their daily lives to analyze and design the sequential steps of software development. The design of the display screen on a mobile device has different sizes. In addition, researcher will include questions that stimulate students to think critically. Undergraduate students have a discussion together within the group and discussions between groups. Show that problem based teaching and learning helps students to understand the content deeply and achieve better results than lecturing. Consistent with the study of Nanthachai N. and Lichanporn I. (2011), it was found that when comparing the average before and after the grades of students studied by problem based learning, it was found that the post scores were significantly higher than before studying. This may be because problem based learning is a student centered learning process in which the learners are users of the knowledge creation process themselves through the process of participation in the development of learning through activities that use thought. Take action and reflect upon the ideas until meaningful learning and learning by self directed in which the learners seek knowledge and find answers on their own such learning has resulted in a greater understanding of the subject matter and can result in better academic achievement.

In addition, learning management using problems based learning for each step. Is also a gradual students development problem determination. It is the process in which the researcher presents the situation that the students have to face and the situation that is determined to be related to the subject of the students currently studying. In this process, Students will develop the ability to identify problems. Step to understand the problem, what the students have practiced will build on from the first step after the problem is identified. Students must analyze problems. Explain the cause of the problem, analyze, group the problem from the given situation. The process of conducting research. At this stage, students

will practice, evaluate and select the information that is around them. Analyze useful information that can be used to solve problems. Can connect the relationship between data from various sources and problematic situations. Analysis and synthesis of knowledge in this step, the students is trained to create guidelines for solving problems. Design the plan for solving problems that are suitable for the situation, summarizing the principles, steps for solving problems. The summary of the answer to the problem and evaluation of the answer. At this stage, the students have practiced examination. Review the synthesized and summarized data to find a solution to the problem. Is a review of what is presented as correct completely relevant and appropriate for how to solve problems or not, and the presentation and evaluation process. At this stage, the students are trained to evaluate the final work by critique. Discussions from friends in groups and different groups which consists of positive and negative perspectives learning management by using problems based learning in this research. From the observation in the class, it was found that in the first experiment. Students are not able to identify problems directly. Lack of systematic thinking skills, cannot link data or systematic data synthesis analysis. The researcher must be responsible for asking questions. And guide thinking methods so students are able to identify problems directly and able to plan data collection until designing the problem solving systematically. Students can develop thinking processes to solve problems better. This may be due to when the students are guided by the learning guidelines. And already implemented causing the students to have a more systematic thinking process knowing, asking questions, analyzing and identifying problems based on interests. Get together to discuss and work with others which leads to the development of other skills along with. Consistent with Jaithiang A. (2013) said that the learning activities are organized activities using various methods. There are many types of students that play an important role in learning, think, search, practice and interact with the group. In order to truly learn and to be able to search for applied knowledge in real life.

According to studies, it has been found that the opinions of problem based learners agreed that problems based learning was able to build professional knowledge and develop problem solving skills. Which is consistent with the study of Yuan H, Williams BA and Fan L. (2008) found that the problem based learning process, Learners can classify analyze problems and can decide how to solve important problems. This is because problems based learning encourages students to solve problems from a given situation, which is consistent with technology problems encountered in real life. Problem solving through the problems based learning process is also consistent with the use of cognitive processes to solve problems, namely identification, analysis of issues, assessing additional information or knowledge necessary with gathering all around information. (Tayyeb R., 2013) However, the opinions of problem analysis skills in this study were lower than other aspects, probably because there was too little time for the students to think and analyze during the study. Reduces learning in the problem based learning process, resulting in a reduced solution proposal. And also

helping to develop self learning and encourage continuous self learning. Students are interested in learning with thinking development and able to work together with others. Consistent with the studies of Tork HMM and Shahin ESM. (2011) It is found that learners are more motivated to learn because problem based learning is student centered. Learners have self determination issues and are responsible for self study. Such learning process will motivate learners to learn and be able to learn continuously. In addition, problem based learning is a learning process that supports coordination. Effective groups and encourages them to share what they have learned. Because problem based learning is a subgroup learning. Learners are involved in expressing opinions, exchanging what they have learned and collaborating to solve problems from specific situations from the learning process in small groups, which will help students to communicate and promote group work effective.

Conclusions and Implications

1. From the study of Design and developing applications for mobile devices after learning by using the problem based learning against the set criteria. It was found that the knowledge scores on Design and developing applications for mobile devices of the students were averaged at 25.27, the standard deviation was 2.02, the comparison of the difference between the knowledge scores in the Design and developing applications for mobile devices and the criteria set found that the scores were higher than the specified criteria.

2. A study of problem solving ability of students after receiving problems based learning. It was found that the problem solving ability of the learners in the overall level was excellent ($\bar{x} = 4.14$, S.D. = 0.68), in which the ability to analyze the result from the problem solving had the highest mean was at an excellent level ($\bar{x} = 4.47$, S.D. = 0.56) and the ability to analyze problems had the lowest mean at a good level ($\bar{x} = 3.87$, S.D. = 0.80)

3. Study of attitudes towards learning management by using problem based learning. It was found that the attitude towards learning management by using problem based learning management Design and developing applications for mobile devices subject. In all 3 aspects at a high level. In the aspect of self development of learners, the highest average ($\bar{x} = 4.34$, SD = 0.68) is at a good level. Next is the role of the instructors ($\bar{x} = 4.25$, SD = 0.72) at a good level and in the learning process by using problem based learning. with the lowest mean ($\bar{x} = 3.87$, SD = 0.83) is at a medium level.

References

Chiangkul, W. (2007). *Thai educational conditions 2006/2007 “Systematic problem solving and educational reform”*. Bangkok: The Secretariat of the Council of Education. (in Thai)

- Eastern Asia University Research Office. (2010). *Synthesize problem based learning procedures*. Patumthani: Eastern Asia University. (in Thai)
- Jaithiang A. (2010). *Teaching principles*. Bangkok: Odeanstore. (in Thai)
- Makmee, P. (2011). Problem-based Learning. *EAU Heritage Journal: social science and humanities*, 5(1), 7-14. (in Thai)
- Nanthachai N. and Lichanporn I. (2011). *The study process by problem-based learning method in food science and technology*. Pathum Thani: Rajamangala University of Technology Thanyaburi. (in Thai).
- Office of the National Economic and Social Development Board. (2019). *The 12th edition of the public plan Innovation is the heart of development*. Bangkok: Office of the National Economic and Social Development Board. (in Thai)
- Panit W. (2013). *Learning development toward 21st Century*. Bangkok: Sor Chareon Printing. (in Thai)
- Suwannoi, P. (2015). *Problem-based Learning. Documentation for the development of Teaching and learning projects*. Khonkaen: KhonKaen university. (in Thai)
- Tayyeb R. (2013). Effectiveness of problem-based learning as an instructional tool for acquisition of content knowledge and promotion of critical thinking among medical students. *JCPSP-J Coll Physici*. 23(1), 42-6.
- The Secretariat of the Council of Education Ministry of Education. (2009). *The study of knowledge about Thai characteristics desirable: ability to face and overcome obstacles*. Bangkok: Ministry of Education. (in Thai)
- Tork HMM and Shahin ESM. (2011). The effectiveness of Problem Based Learning (PBL) in nursing education: cross-cultural student's perspective. *Journal of American Science*. 7(11), 516-21.
- Yuan H, Williams BA and Fan L. (2008). A systematic review of selected evidence on Developing nursing students' critical thinking through problem-based learning. *Nurse Educ Today*. (28), 657-63

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