

The Development of Problem-Based Learning Management Activities to Promote Attitude Towards Science and Technology Subjects of Grade 5 Students

Submitted 5 February 2023 Revised 29 June 2023 Accepted 29 June 2023

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DOI: 10.30870/gpi.v4i1.19095

Abstract

The objectives of this research were; (1) to develop a problem-based learning management activity that is effective according to the 80/80 criterion and (2) to promote attitudes towards learning science and technology subjects to pass the 70% threshold. This research is a developmental research model which focuses on design and innovation development and is divided into 2 phases: the development process and the assessment process. This research is in phase 2. The sample group consisted of 32 grade 5 students studying in the first semester of the academic year 2022 at a school in Kalasin Province, Thailand. Research tools include; (1) 4 learning management plans and (2) attitudes toward learning science and technology subject tests. The statistics used in data analysis were percentage, mean, and standard deviation. Collect data on attitudes toward learning science and technology subjects with a 5-level rating scale and 10-item list. The results showed that; (1) The overall efficiency of the problem-based learning management activities was at the highest level. ($X = 4.99$, $S.D. = 0.02$). Moreover, (2) The effect of students' learning attitude towards science and technology after organizing the problem-based learning management activities was high ($X = 4.38$, $S.D. = 0.84$).

Keywords: Problem-Based Learning, Attitude, Science and Technology

INTRODUCTION

In today's world, there are many tests of knowledge. The Programme for International Student Assessment (PISA) exam measures the knowledge of international students. Thailand is one of the countries where PISA was administered in 2015 and also focused on young people's feelings toward science: values, beliefs, and attitudes toward science. It found that students with negative feelings had low assessment results, but students with good feelings were associated with high assessment outcomes (Institute for the Promotion of Teaching Science and Technology, 2016). Belin and Kisid (2015) says that revealed that attitudes of toward evolutionary science are strongly related to science achievement.

Attitude is a very interesting factor in the study of attitudes toward subjects, especially attitudes toward science and technology since they are very important today and having a positive attitude towards science and technology is also an important part of the academic curriculum (Koballa, 1988). Studying attitudes are now acceptable because having a positive attitude helps students achieve good academic achievement (Norwich & Duncan, 1990). Rogers says that human beings can improve themselves well if they are in a relaxed, independent, and truly learner-focused place (Rogers, 1969).

Problem-based learning management learners can build their knowledge and use the problems encountered in real situations as a motivator to learn to solve problems through

teamwork. (Norman & Schmidt, 2000) defines PBL as “a learning approach that encourages the students to upgrade their motivation level, interest, and is also pleasurable, which resulted from the process of working towards accepting or solving a problem.” (Barrows & Tamblym, 1980; Albanese & Mitchell, 1993; Barrows, 1996) It was theorized that problem-based learning (PBL) can have effect on higher order thinking ability of student which helps them in improving the attitude towards learning as well as increases their academic achievement (Barrows, 1996).

For the reasons mentioned above, the objectives of this research is to develop a problem-based learning management activity to promote attitudes toward science and technology learning of grade 5 students. It is also a guideline for learning management to promote attitude towards science learning and develop science learning management activities to be effective in the future.

METHOD

Research Methodology

This research is Developmental Research Type I (Richey and Klein, 2007), which focuses on design and innovation development and is divided into 2 phases. Namely the development process and the evaluation process. This research is in phase 2 by developing a problem-based learning management activity, showing details as follows.

Phase 1 Development Process

1. Study current learning management problems and learning management needs development of problem-based learning management activities.
2. Design activities for problem-based learning management using the information obtained from studying the problem of attitude towards science and technology learning. Create and develop learning plans and tools used to collect data. After that, it will be examined by 3 experts.
3. Experiment with the problem-based learning management plan was applied to the experimental group. Namely, grade 5/1 students in semester 1, the academic year 2022, 16 students were obtained by purposive sampling. A total of 4 plans and used to measure the attitude toward learning science and technology subjects.

Phase 2 Evaluation Process

Organized 4 plans of problem-based learning activities with grade 5/2 students. After organizing the learning management activities, a sample group of students was used to measure their attitude toward learning science and technology.

Sample group

Phase 1 The research samples were divided into 2 groups, namely, 3 experts, 1 content expert, 1 teaching expert, and 1 measurement and evaluation expert, and 16 students in grade

5/1 who are studying in the first semester of the academic year 2022 at a school in Kalasin Province, Thailand acquired by purposive sampling.

Phase 2 The sample group of 32 students in grade 5/2 studying in the first semester of the academic year 2022 at a school in Kalasin Province, Thailand was acquired by purposive sampling.

Research tools

The tools used in researching on Development of problem-based learning management activities to promote attitude towards science and technology subjects of 5th graders are as follows.

Problem-based learning management plans, 4 plans total learning management time is 12 hours have passed the evaluation of the appropriateness of the learning management plan from experts with an average of 4.99, being the most appropriate.

Attitudes toward learning science and technology subject tests using a rating scale, 5 levels, 10 items. Through determination, The Index of item objective congruence is 0.90.

Data collection

In this research the researcher collected data by the steps for collecting data are as follows:

1. Using the attitude scale to learn science and technology subjects of grade 5 students with the sample group.
2. Organize learning activities with the sample group of students. Using the problem as a base according to the learning management plan, steps 1-4 complete all 4 plans in 12 hours together with collecting scores for measuring attitudes toward learning science and technology subjects and analyzing the data.
3. Organize learning activities with the sample group of students. Using the problem as a base according to the learning management plan, steps 1-4 complete all 4 plans in 12 hours, along with collecting scores and measuring attitudes towards learning science and technology subjects. Then collect the data and analyze the data.

Data Analysis

Find the appropriateness of the problem-based learning management plan using basic statistics, including mean. Then take the obtained mean to translate the result into appropriateness. Likert, Renaissances A. (1961)) as follows:

4.51 – 5.00 Appropriateness at the highest level

- 3.51 – 4.50 High level of suitability
- 2.51 – 3.50 Moderate suitability
- 1.51 – 2.50 Low level of suitability
- 1.00 – 1.50 The lowest Low level of suitability

Analyze the data from the attitude towards learning science and technology subject form. Obtained from the test after the end of the learning management activities by finding the mean, percentage, and standard deviation. If the learner gets 70 percent pass the criterion, less 70% does not pass the criterion.

RESULTS AND DISCUSSION

Subject research the development of problem-based learning management activities to promote attitude towards learning science and technology of grade 5 students can present the research results as follows.

The results of the development of learning management activities by applying the problem-based learning model for grade 5 students to be effective according to the 80/80 criterion appear in Table 1

Table 1. The results of the development of learning management activities by applying the problem-based learning model for grade 5 students to be effective according to the 80/80 criterion.

Assessment items	Full marks (Mark)	Number Of students (Person)	Mean	Standard Deviation	Percentage
Efficiency of process	60	32	48.06	1.68	80.10
Efficiency of product	40	32	32.53	1.67	81.33

Table 2. Development of learning management activities.

Inquiry Teaching (5E) (Of the school)	Problem-based learning management (Office of the Education Council, 2007)	Problem-based learning management (Researcher)	Differences in learning management	Teacher role
Step 1: Engagement or Arouse interest. It is an introduction to the lesson of interest or doubt.	Step 1: Determine the problem. The instructor classifies the situation as a pique of interest.	Step 1: Determine the problem. Use the situation as a motivator for learners.	-	Coach and Facilitator
Step 2: Exploration or explore and find. It is about understanding the issues to be studied and searching for Information.	Step 2: Understand the problem. Learners understand the problem and must explain it.	Step 2: Understand the problem. Motivate learners with questions to understand the problem.	Questions are used as motivation to motivate learners to understand the problem.	Coach

Inquiry Teaching (5E) (Of the school)	Problem-based learning management (Office of the Education Council, 2007)	Problem-based learning management (Researcher)	Differences in learning management	Teacher role
Step 3: Explanation or explain and conclude. It is the use of the obtained data to analyze and draw conclude	Step 3: Conduct research studies Learners must study the information on their own.	Step 3: Conduct studies. Learners research for themselves.	-	Coach and Co-learner
Step 4: Elaboration or expand knowledge. It is the use of the knowledge created to link it with previous knowledge.	Step 4: Bring knowledge to exchange and learn together.	Step 4: Synthesize knowledge. It's about bringing the data to a conclusion.	-	Coach
Step 5: Evaluation. It is an assessment of learning through different processes.	Step 5: Summarize and evaluate the answers. The learner summarizes the knowledge in the big picture.	Step 5: Summarize and evaluate the Answers. Bring conclusions and create new knowledge.	Use summaries to create new knowledge.	Coach
	Step 6: Present and evaluate the work. Use the information to build knowledge together to evaluate the work.	Step 6: Present and evaluate the work. It is about presenting the work from the conclusions and evaluating the work.	-	Co-learner

For Table 1 and Table 2, the results of the development of learning management activities by applying the problem-based learning model for grade 5 students to be effective according to the 80/80 criterion. Inquiry-based learning (5E) focuses on helping students to understand what they can learn by themselves, interest generation stimulating learning, finding answers yourself, and developing skills by asking questions. However, Inquiry-based learning (5E) at school teaching and learning still focuses on lectures and lets students mainly study from video media on their students. Therefore, interacting less with classmates, teachers, and other environments, the students did not study the problems they were interested in. Inquiry-based learning (5E) is therefore still unable to develop the students as they should the researcher. Therefore, Problem-based learning management is learner-centric. Students can choose the issues they are interested

in and work in groups according to the concept of the Office of the Education Council. There are 6 steps. Step 1: determine the problem. Step 2: understand the problem. Step 3: Conduct studies. Step 4: Synthesize knowledge. Step 5: Summarize and evaluate the Answers. Step 6: Present and evaluate the work. It is a learning arrangement that makes learners fun. There is an exchange of ideas and collaboration. Teachers have a variety of duties and differ in each step. As a result, problem-based learning management is effective at 80.10/81.33, higher than the specified threshold of 80/80.

The effect of promoting attitudes toward science and technology studies of grade 5 students to pass the criteria of 70 percent.

The effect of promoting attitudes toward science and technology studies of grade 5 students to pass the criteria of 70 percent appears in Table 3.

Table 3. The effect of promoting attitudes toward science and technology studies of grade 5 students to pass the criteria of 70 percent.

Assessment items	Percentage	Standard Deviation	Assessment results
1. Science and technology subjects are no dull subjects.	70.0	0.73	Pass the assessment
2. Science and technology are fun subjects to study.	73.0	0.87	Pass the assessment
3. Science and technology are subjects that make humans more aware of how to solve problems.	72.0	0.86	Pass the assessment
4. Science and technology are subjects that promote creativity.	70.0	0.79	Pass the assessment
5. Science and technology subjects are modern subjects.	70.5	0.79	Pass the assessment
6. Students like to conduct experiments in science and technology subjects.	71.5	0.94	Pass the assessment
7. Students think that studying science and technology is a non-difficult subject.	72.0	0.82	Pass the assessment
8. Students like to study and understand science and technology subjects.	70.5	0.90	Pass the assessment
9. Students apply their knowledge of science and technology to their daily lives.	72.5	0.87	Pass the assessment
10. Students are always up to date on the progress of science.	70.5	0.80	Pass the assessment

From Table 3. It was found that the latter uses learning management activities using problems-based graders 5 students' assessment of attitudes towards science and technology studies averaged 4.38 points, representing 71.25 percent, well above the threshold set at 70 percent. It was shown that after using problem-based learning management activities, students had a 70 percent overall attitude toward science and technology. When considering the aspects, it was found that side science and technology are fun subjects to study, there is a maximum

percentage of 73.0 and followed by side students apply their knowledge of science and technology to their daily lives there is a percentage of 72.5 respectively.

The researcher summarized and discussed the research results according to the research objectives, divided into 2 items as follows.

1. The results of the Problem-based learning management activities to promote attitudes towards science and technology learning graders 5 students.

The results of the Problem-based learning management activities to promote attitudes toward science and technology learning among grade 5 students showed that the researcher created 4 plans, 3-hour plans each. Using the problem as a base consists of 6 steps: Step 1: determine the problem. Step 2: understand the problem. Step 3: Conduct studies. Step 4: Synthesize knowledge. Step 5: Summarize and evaluate the Answers. Step 6: Present and evaluate the work. 3 experts have reviewed the problem-based learning management plan. It was found that the management plan learns using problems as a base. It is appropriate at the highest level. The average expert opinion score is 4.99, and when put into trying to determine the effectiveness of learning management activities. It was found that students scored 80.10 percent on the process test, and the average post-learning activity score was 81.33 percent. Problem-based learning management activities are effect 80.10/81.33 above the established threshold. This may be due to student-centered learning management activities students can choose the problems they are interested in and search for articles freely, allowing students to interact with peers and teachers. The learning management activities also include games to make the students have fun. This is consistent with Mala et al. (2017), has researched comparisons of learning achievement, science process skills and scientific attitude of grade 6 students who learned using the project teaching approach and learning activities using problem-based learning. The research found that the science-based learning management plan for the daily life of graders 6 students who managed project-based learning with problem-based learning was effective at 81.43/87.50 and 81.65/88.50, respectively.

2. The results of learning activities to promote attitudes toward science and technology learning of grade 5 students using problem-based learning management activities were higher than the set criteria by 70 percent.

The results of learning activities to promote attitudes toward science and technology learning of grade 5 students using problem-based learning management activities. They had an average score of 3.68, representing 73.56 percent, higher than the threshold set at 70 percent. This may be because problem-based learning activities are organized by learners

using the situation in question to describe a phenomenon or real event encountered in everyday life allowing learners to pursue their knowledge by working together in small groups. Knowledge is acquired through self-learning, and it is about integrating knowledge into solving problems on their knowledge exchange and free expression can result in students having fun learning and learning more. This is consistent with the research results of Kanokwalai, et al. (2017) It has researched a study of science learning achievement and attitudes learned by learning management problem-based model for grade 6 students. The results showed that science achievement by problem-based learning management for 6th grade compares to 70 percent of the statistically significant score at .05, and sixth graders who take problem-based learning management have a level of problem-based learning attitude toward high level.

CONCLUSION

The results of the Problem-based learning management activities to promote attitudes toward science and technology learning among grade 5 students showed that the researcher created 4 plans, 3-hour plans each. Using the problem as a base consists of 6 steps: Step 1: determine the problem. Step 2: understand the problem. Step 3: Conduct studies. Step 4: Synthesize knowledge. Step 5: Summarize and evaluate the Answers. Step 6: Present and evaluate the work. 3 experts have reviewed the problem-based learning management plan. It was found that the management plan learns using problems as a base. It is appropriate at the highest level. The average expert opinion score is 4.99. When put into trying to determine the effectiveness of learning management activities. It was found that students scored 80.10 percent on the process test, and the average post-learning activity score was 81.33 percent. Problem-based learning management activities affect 80.10/81.33 above the established threshold of 80/80.

Attitude towards students' science and technology studies after organizing problem-based learning management activities found that the average attitude toward studying science and technology was 4.38, which is a high level, representing 71.25 percent.

SUGGESTIONS

Suggestions for applying the research results

Instructors should prepare various materials to facilitate and advise students to be able to organize activities on time. Teachers should understand the details of each learning management process well and must plan the implementation systematically so learning management can proceed effectively.

Suggestions for further research

Research and development of problem-based learning management activities should be conducted in conjunction with other learning management methods. The development of problem-based learning management activities should be studied to promote other skills.

ACKNOWLEDGEMENT

Researchers thank the three experts who helped validate the research instruments and the director, faculty, and students who cooperated in this research.

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