Developing the Mixed Learning Approach with the Problem-Based Learning Model for Enhancing Mathematics Process Skills of Primary Educational Students

Khanitta Siriwongkhan[1]

Thapanee Seechaliao[2]

Abstract

The aims of this research study were 1) to synthesis the mixed learning approaching components with the problem-based learning model for enhancing mathematics process skills of primary educational students, 2) to develop the mixed learning approaching components with the problem-based learning model for enhancing mathematics process skills of primary educational students, and 3) to examine the effects of the mixed learning approaching components with the problem-based learning model for enhancing mathematics process skills of primary educational students. The instructional administrations were designed on three phases, namely: the integrated instructional model by documents' synthesis and related researches as the first phase; developing the integrated teaching styles to develop an assessment model, validate and certify the instructional designs with the group discussion was conducted by seven educational experts and assessed, and validated the instructional designs by the five professional experts as the second phase, and to integrate the effects of the mixed learning approaching components with the problem-based learning model for enhancing mathematics process skills of 34 primary educational

[1] Ph.D. Candidate in Educational Technology and Communication, Faculty of Education, Mahasarakham University

[2] Faculty of Education, Mahasarakham University

students at the 5th grade level in Ban Tha Lad School who sat into a Mathematics class in the second semester, academic year 2016 with the purposive random sampling technique was selected. The research instruments were assessed with the 43-item *Mathematics Process Skill Measurement* (MPSM), students' learning outcomes were assessed with the *40-item Learning Achievement Test* (LAT), and students' satisfactions were assessed with the 28-item *Satisfied Assessment Questionnaire* (SAQ). Statistically significant was analyzed with percentage, mean, standard deviation, and dependent samples t-test.

The results of this research have found that:

1. To synthesis the mixed learning approaching components with the problem-based learning model for enhancing mathematics process skills of primary educational students composes of four principle components, such as: 1) designing principal, 2) designing purposes, 3) instructional process steps, which reveals that determining problems, understanding problems, conducting integrations, knowledge synthesis, to conclude and assess the assessing values, and presenting and evaluating conductions; and 4) in terms of the assessing and evaluating mathematics process skills, it was found that; students' responses of their problem-solving abilities, reasoning abilities, communicating abilities on mathematics and presentations, linking knowledge abilities, and creative thinking abilities are processed.

2. To develop the mixed learning approaching components with the problem-based learning model for enhancing mathematics process skills of primary educational students was assessed by the five professional experts indicate that of the most appropriate level ($\overline{X} = 4.70$).

3. The effects of the mixed learning approaching components with the problem-based learning model for enhancing mathematics process skills of primary educational students, it was found that:

3.1 Students' responses of their learning outcomes onto the determining performance criteria with the efficiencies of the processing performance and resulting performance (E_1/E_2) with the *problem-based learning* instructional model indicated that of 86.00/83.43 and indexing effectiveness evidence of 0.7253.

3.2 Comparisons between students' learning achievements of the PBL to their post-test are higher than pre-test assessments, and indicate that of statistically significant at .01 level, differently.

3.3 Students' performances of their satisfactions to their instructional designs according to the mixed learning approaching components with the PBL model for enhancing mathematics process skills of primary educational

students, it was found that students' learning developments indicate that of the high level.

Keywords: Problem-based learning model, enhancement, mathematics process skills.

Introduction

The current age of society was the society of advancement in information technology leading to the boundless world. As a result, it was inevitable for every country to compete with each other. The competition needed to use potentiality of people in the countries to obtain both of knowledge and competency very well. Therefore, human development was crucial. Since human resource development was important for vocational development. It could enhance the work system for quality as well as universal standard in order increase the competency level in competition and survival of the organization as well as the nation. There were four components of activities for human development including the provision of education, training, development, and knowledge management for the staffs which was the preparation for concrete change as well as the ability to lead the national development efficiently. (Siengon, 2012: 25) So, it was necessary for the educational institution to provide learning process management for students to develop their competency level especially the competency to use technology for education in searching for knowledge by them continuously as lifelong learning. According to the National Education Act, Section 24 and Section 66 (Ministry of Education, 1999) It was relevant to new style learning during the 21st century that the students should be able to construct their own knowledge occurred by their understanding. Problem–based learning or PBL was the learning model caused by Learning Theory called Constructivism.

The students had to construct new knowledge from the problem being occurred in the real world as a learning context. (King Mongkut's University Technology North Thailand, 2002: 18), use various kinds of media like blended learning model in both of classroom teaching or Face to Face and teaching by computer. (Bonk and Graham, 2006). It was to enhance the integrated instruction, adjust the students' learning situation to be an expectation of educational institutions by providing online education in order to serve the students' needs in associating in every place and time with the common goal in online learning, and communication with each other like the Online Learning. For new Mathematical instruction, it was based on appropriate teaching technique. The instructional activity management called Problem-based Learning model which was one of

the best techniques being used for developing the students' learning quality. Because it was congruent with guidelines for educational management according to the National Education Act 1999 which could cause the students to have skill in analyzing, problem-solving, and creative thinking. Since the students had to search for knowledge continuously, it was necessary to lead the learning process to be lifelong learning because the students' former knowledge would be associated with new knowledge throughout the time. Consequently, the students were not lag behind. They would keep pace with the incidence, situation, and world. They could adjust themselves with the future world as best as they could. (Dharmabut, 2008: 3).

According to O-NET in class level 2 (Pratomsuksa 6, 2013) academic year, mathematics (64) Substance 6, mathematical process skill, their mean score was 34.53. The findings of educational management were lower than criterion. The problem situation has occurred from instructional activity management. The students were lacked conceptual thinking skill, calculation principle, mathematical process skills. Mathematical instruction still lacked teaching media which was the integral instrument in practicing the calculating skill which would stimulate the students' interest for not being bored with the study. Therefore, it was important to bring suitable teaching media and technique being used in instructional management so that the students would obtain their Mathematical process skill. According to the above situation, it was shown that the students should obtain development in both of Mathematical knowledge and process, the learning management which would lead to the development of quality students by designing the learning management guidelines for students' success and utility from learning as much as possible. Promoting the efficient Mathematical learning process, the problem-based learning process was applied in network instructional management for students to study, search for, and discuss based on Problem-based instruction principle. Therefore, the researcher developed the blended problem-based learning model in promoting Mathematical process skill for Primary Educational Students by organizing the content to be congruent with as well as serve the students' learning achievement, including the content as well as measurement and evaluation clearly, and presenting in the precise pattern is easy to understand. Consequently, the students would learn and comprehend more in order to enhance the students to know how to search for knowledge and work in team by participating and interacting with each other through shared activities on internet network in the lesson, on web, e-mail, and web board to accomplish the same goal besides leading to the learning development as well as improved learning efficiency very well.

Objectives

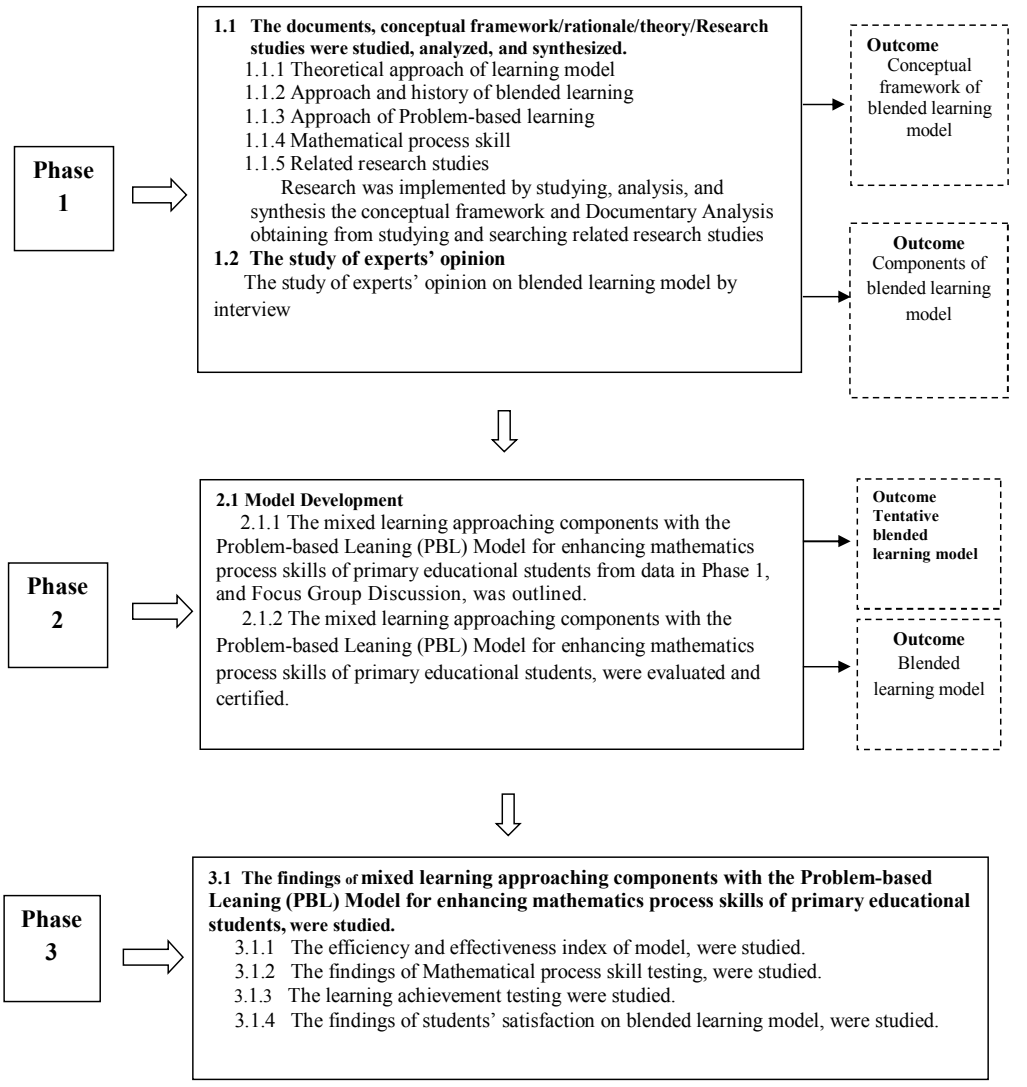
1. To synthesis the mixed learning approaching components with the problem-based learning model for enhancing mathematics process skills of primary educational students.

2. To develop the mixed learning approaching components with the problem-based learning model for enhancing mathematics process skills of primary educational students.

3. To examine the effects of the mixed learning approaching components with the problem-based learning model for enhancing mathematics process skills of primary educational students.

Mothodology

There were 3 Phases as follows:



Data Analysis

The scores from students' mathematical process skill testing, were calculated for basic statistics including the percentage, mean ($\bar{X}$), and standard deviation. In addition, the mean scores of mathematical process skill between pretest and posttest were compared by using the testing statistics. The students' satisfaction with the blended problem-based learning model for promoting mathematical process skill, were evaluated by the mean, and standard deviation.

Results

On the First Phase: the analysis of the components of the Problem-based learning (PBL) Model for enhancing mathematical process skills of Primary educational students', were analyzed. The basic information of various components related to Problem-based learning (PBL) Model for enhancing mathematical process skills of Primary educational students', were synthesized by analyzing and synthesizing the conceptual study and documentary analysis.

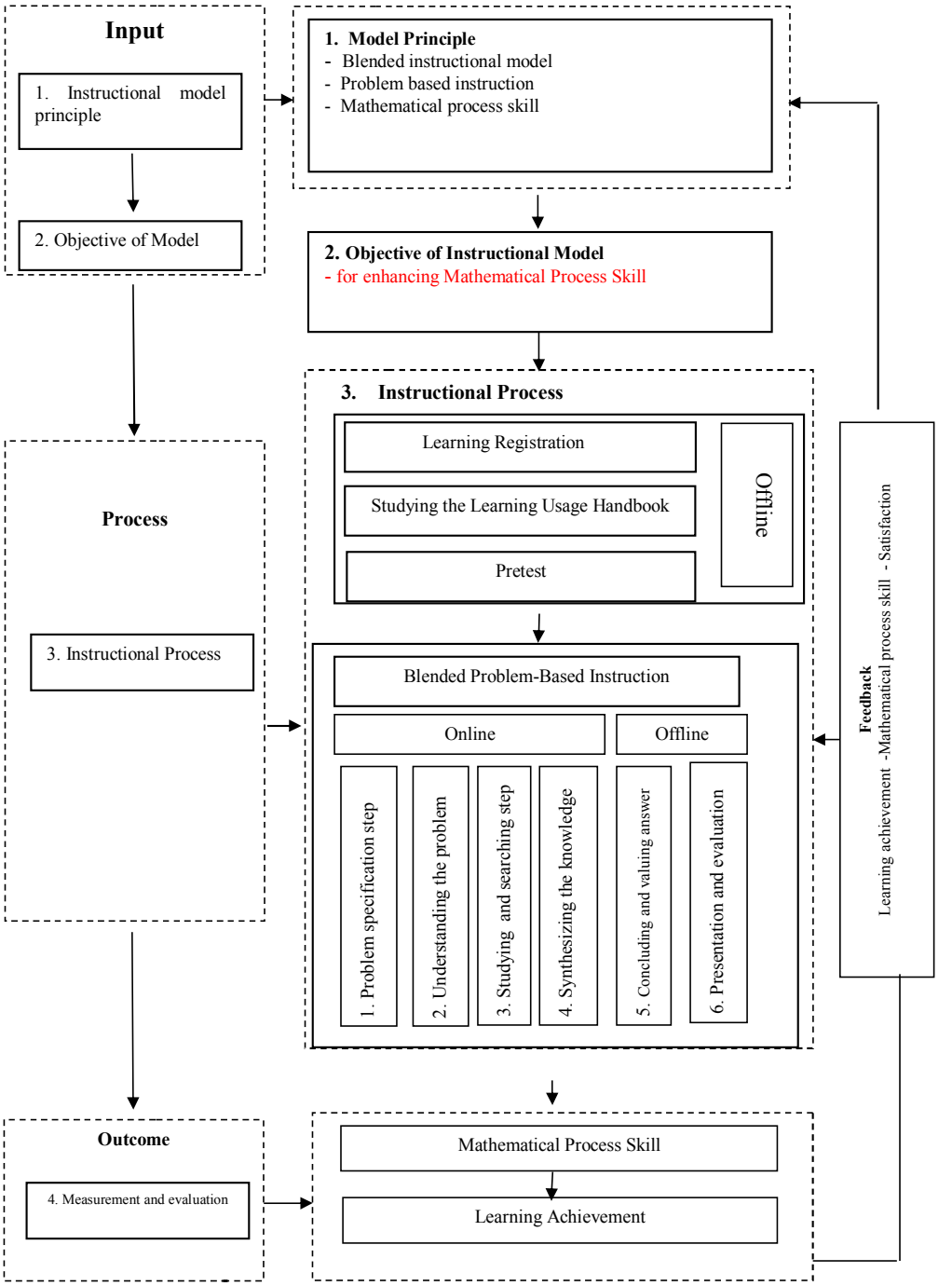
According to the study of related document and *Models of Teaching* based on the approaches of Thorne (2003) ; Joyce and Weil (2004) ; Kammanee (2002b: 68) ; Jinjo (2007: 133); Wanpiroon (2008: 132), Kantabchai (2011: 169), included: 1) the principle model, 2) objective model, 3) instructional process, and 4) measurement and evaluation.

The *Blended Learning*, which based on approaches of Rovia and Jordan (2004) ; Carman (2005) ; Jinjo (2007: 39-40) ; and Kantabchai (2011: 169), were combined by Traditional Approach including the Face-to-Face Learning, and Online Learning. The learning activities were organized by Problem–Based Learning included of six steps as follows: Kietlerdnapa (1993: 65-66) Department of Curriculum and Instruction Development (2000), Rattanaprom (2001: 38-40) ; Rangabtook (2001:18) ; Klaimongkol (2002: 103) ; Lekakul (2009: 15) ; the Office of the Education Council (2007) ; the Research Office of Eastern Asia University (2010: 12) ; Barrows (1980) ; and Schmidt (1993).

Step 1: The problems were specified.
Step 2: The problems were comprehended.
Step 3: The study and searching data were implemented.
Step 4: The knowledge was synthesized.
Step 5: The answers were concluded and valued, and
Step 6: The findings were presented and evaluated.

The mathematical process skill based on core curriculum of basic education, consisted of: 1) the problem solving skill, 2) the reasoning skill, 3) the Mathematical communication and presentation skill, 4) the knowledge association skill, and 5) the creative thinking.

On the Second Phase: the development of blended problem-based learning model for promoting Mathematical process skill for Primary School Students, found that the experts viewed that the blended problem-based learning model for promoting Mathematical process skill for Primary School Students included the following details:


Input
1. Instructional model principle
2. Objective of Model
1. Model Principle
- Blended instructional model
- Problem based instruction
- Mathematical process skill
2. Objective of Instructional Model
- for enhancing Mathematical Process Skill
3. Instructional Process
Learning Registration
Studying the Learning Usage Handbook
Pretest
Offline
Process
3. Instructional Process
Blended Problem-Based Instruction
Online
Offline
1. Problem specification step
2. Understanding the problem
3. Studying and searching step
4. Synthesizing the knowledge
5. Concluding and valuing answer
6. Presentation and evaluation
Feedback
Learning achievement -Mathematical process skill - Satisfaction
Outcome
4. Measurement and evaluation
Mathematical Process Skill
Learning Achievement

There were 2 Parts in development of learning model as follows:

Part 1, the details of model regarding to the objective of model ($\bar{X}$ = 4.20, S.D. = 0.84), learning process of model ($\bar{X}$ = 3.75, S.D. = 0.64), the principle of model ($\bar{X}$ = 3.60, S.D. = 0.63), and the measurement and evaluation of model ($\bar{X}$ = 3.60, S.D. = 0.55), the Propriety was in "somewhat satisfied" level. Considering the overall mean value, the Propriety was in "somewhat satisfied" level ($\bar{X}$ = 3.78, S.D. = 0.65). Part 2, the details of steps and activities in blended problem-based learning model, in overall each aspect, found that in the instructional activity management based on problem-based model, the Propriety was in "somewhat satisfied" level ($\bar{X}$ = 3.93, S.D. = 0.59), the activities using during the step of preparation for readiness, the Propriety was in "somewhat satisfied" level ($\bar{X}$ = 3.90, S.D. = 0.61), and in the measurement and evaluation, the Propriety was in "somewhat satisfied" level ($\bar{X}$ = 3.68, S.D. = 0.56) when considering the overall mean value.

Part 2, the details of steps and activities in blended problem-based learning model, in overall of each aspect, the Propriety was in "somewhat satisfied" level. ($\bar{X}$ = 3.87, S.D. = 0.60) Considering each aspect, in overall of blended problem-based learning model for promoting the Mathematical process skill for Primary School Students, found that the Propriety was in "The Problem-based learning model for promoting Mathematical process skill for Primary School Students "somewhat satisfied" level. ($\bar{X}$ = 3.83, S.D. = 0.64)

On the Third Phase, the study of findings in using the Blended Problem-based Learning Model for Enhancing Mathematics Process Skills of Primary School Students.

Table 1: The Efficiency of Blended Problem-based Learning Model for Enhancing Mathematics Process Skills of Primary School Students.

Score	Number of Students	Full Score	Score proportion, percentage	Mean	Percent
Process Efficiency (E_1)	34	90	100	77.40	86.00
Outcome Efficiency (E_2)	34	40	100	32.58	83.43

According to Table 1, reported that the processing efficiency (E_1) was 86.00%, and the resulting efficiency (E_2) was 83.43%. Therefore, the efficiency of developed learning model was 86.00/83.43 as the standardized criteria.

Table 2: The Effectiveness Index of Blended Problem-based Learning Model for Enhancing Mathematics Process Skills of Primary School Students.

Sample	Full Score	Total Score		Effectiveness Index (E.I.)
		Pretest	Posttest	
34	3,060	1,425	2,611	0.7253

According to Table 2, reported the effectiveness index of the blended problem-based learning model for promoting the Mathematical process skill for Primary School Students, was 0.7253. It means that evidence of 72.53% of students' perceptions to their blended problem-based learning model toward their learning progress.

Table 3: Mean Scores of Students' Learning Achievement to their Pretest and Posttest Assessments for the PBL Scales

Evaluation	0verall student (n=34)						
	Pretest (20 points)		Posttest (20 points)		df	t	P
	$\bar{X}$	S.D.	$\bar{X}$	S.D.			
Problem Solving Skill	8.15	1.635	15.06	1.556	33	17.415	0.000*
Reasoning Skill	8.03	1.058	15.91	1.026	33	28.889	0.000*
Communicating Skill	8.62	1.809	15.79	1.112	33	19.188	0.000*
Associating Skill	8.88	1.225	15.26	0.790	33	23.897	0.000*

* Significant at .05 level

According to Table 3 reported on students' perceptions of their instructional design with the *Blended Problem-Solving* toward their *Problem-based Learning* model for fostering their mathematical process skills of primary students. Overall on mean average scores of the posttest are higher than the pretest at the level of .05, significantly.

Table 4: The comparison of mean scores in creative skill of mathematical skill and process between pretest and posttest of experimental group students taught by blended problem-based learning model for primary school students' creative skill.

Evaluation	Overall Students (n=34)				df	t	P
	Pretest (10 points)		Posttest (10 points)				
	$\bar{X}$	S.D.	$\bar{X}$	S.D.			
Creative Skill	8.24	1.182	9.38	0.922	33	18.952	0.000*

* significant at .05 level

According to Table 4, reported on student's perceptions of their instructional design with the *Blended Problem-Solving* toward their *Problem-based Learning* model for fostering their mathematical process skills of primary students. Overall the prottest mean average score of the creativity higher than the pretest at the level of .05, significantly

Table 5: The comparison in mean scores of mathematical skill and process between pretest and posttest of experimental group taught by blended problem-based learning model for supporting mathematical skill and process of overall primary school students.

Evaluation	Overall Students (n=34)				df	t	P
	Pretest (90 points)		Posttest (90 points)				
	$\bar{X}$	S.D.	$\bar{X}$	S.D.			
Overall mathematical skill and process	41.91	3.029	76.79	3.179	33	42.565	0.000*

* Significant at .05 level

According to Table 5 reported on students' perceptions of their instructional design

with the *Blended problem-based* toward their *Problem-based Learning* model for fostering their mathematical process skills of primary students. Overall mean score of Mathematical process skill in problem solving, reasoning, communicating, associating the knowledge, and creative thinking. The posttest are higher than the pretest at the level of .05, significantly.

Focused on Table 5, students' perceptions of their performances to their satisfactions, the satisfaction on developed model was in "Somewhat satisfied"

level ($\bar{X}$ = 4.28, S.D. = 0.62). Considering each aspect, found that all of 3 aspects including the blended model learning, the instructional process management, and the preparation before learning and teaching, the satisfaction level was in "Somewhat satisfied" level.

Discussions

1. The tried out Mixed Learning Approach with the Problem-based Learning Model for Enhancing Mathematics Process Skills of Primary School Students, the developed model by the researcher was designed by using system theory including: the input, the process, the measurement and evaluation, and the feedback. For the step of model construction and development, the Focus Group Discussion by 7 experts was implemented. In addition, the model was evaluated and certified. The model was tried out before being used. The developed model was congruent with knowledge management of Primary School Students. Since it could cause the students to be energetic and interested in Mathematical study because they had learnt computer subject as well as media design to be interesting. It was supported by approach of Na-reu-nat-wat-ta-na (2011: 220) ; Chan-ta-na-rung-pak (2005). There were 6 steps of components in problem-based learning. Step 1, the problem specification, it was the Introduction by teachers who assigned the problem for students to discover or search for using group process in sharing their knowledge in order to find the real cause of problem. The answer included what the students had learnt started by their attempt to understand and interpret the problem by using the reasoning thinking process associated with their prior knowledge to construct their comprehension as well as interpretation the meaning of that problem. Step 2, the problem understanding, the explanation for problem being understood and explained by everyone in group clearly and congruently. It was consensus. Step 3, the studying and searching were implemented. Each group member was assigned to be responsible in searching supplementary information from various sources. They might be supervised by their teachers, for instance, the academic textbook and document, the experts in internet searching, information from community and local wisdom, etc. The members might be assigned individually or in group depended on duration determined by the teachers. Step 4, the knowledge synthesis, the group members concluded body of knowledge being obtained by problem analysis as well as new knowledge searching in order to find the guidelines for solving the problem from specified objective and hypothesis. Step 5, the answer conclusion and evaluation, each group students summarized their own performance, and evaluated their performance whether the searching information was suitable or how much it was suitable by trying to investigate their viewpoint in their own group freely. Students in every group cooperated in concluding the overall body of knowledge. Step 6, the presentation and evaluation

of findings, the members presented their searching information to be presented in group. The group members agreed to search for supplementary information to be sufficient. If they had sufficient information, it would be concluded for being principle as well as guideline for answering the question or solving the problem based on occurred situation. Besides, the students were allowed to conclude the value of ethics or morality being found by their group experience and searching from various sources which was the process in mental assimilating and reviewing their own behavior modification which would cause the students' inculcation in being responsible for themselves as well as their society more. It was the step which the students would discuss their own performance in order to report body of knowledge being concluded from their learning activities. In this step, the teachers and students should discuss the findings from experience sharing by focusing on students to search for by themselves. The teachers provided feedback as well as reinforcement for their students so that they would be interested in searching for knowledge, improving themselves, and understanding the others. It was congruent with approach of Kiet-lerd-na-pa (1993) ; Poom-ma-la (1995) ; Dool-pak-pai-sal (2003) ; To-tong (2004) ; Da-sri (2007) ; Wilhelmiina (2004) ; Egon (2004). The experts evaluated the teaching model and instructional management model. It was found that the quality of Propriety being ranged from Good to Very Good. Since the blended problem-based learning model, was the learning model being focused on wisdom process. It was a model of searching process focusing on students to be the learning center as well as to act by themselves.

2. The Mixed Learning Approach with the Problem-based Learning Model for Enhancing Mathematics Process Skills of Primary School Students. since it was designed as System Approach. There were 4 major components of system approach including: 1) the Input, 2) the Process, 3) the Output, and 4) the Feedback. The Input was component of model including: the principle, objective, and content. The Process referred to the instructional activity management based on Blended Problem-based Learning Model for Enhancing Mathematics Process Skills of Primary School Students. The Output referred to instructional activity management based on the blended problem-based learning model for promoting Mathematical process skill. The Feedback referred to the technique in using the findings from output for improving the system to be more efficient. It was congruent with the instructional design and development of See-cha-leau (2010) by constructing the design model and developing the learning based on creative problem solving in engineering in order to develop the engineer undergraduate students' creative thinking skill to be teaching design with system and step based on best practice clearly. Furthermore, the experts' interview, found that the instructional design and development, was systematically implemented in every step which could develop the instruction as well as systematic thinking. Moreover, the researcher designed blended instructional activities as well.

3. The findings of Mixed Learning Approach with the Problem-based Learning Model for Enhancing Mathematics Process Skills of Primary School Students, the researcher studied the tried out findings based on every step of research process in order to obtain reliable information started by the study of efficiency of learning model in Mathematics for Pratomsuksa 5, to be efficient as criterion as 75/75, and the study of trying out. The details were presented as follows:

3.1 The study of efficiency of the Mixed Learning Approach with the Problem-based Learning Model for Enhancing Mathematics Process Skills of Primary School Students, to obtain efficiency as specified criterion 75/75. According to experimental findings, found that the developed blended problem-based learning model promoting Mathematical process skill for Primary School Students, by the researcher, its efficiency was = 86.00/83.43. It was shown that the blended problem-based learning model promoting Mathematical process skill, obtain higher efficiency than the specified criterion 75/75. Since the process in developing the blended problem-based learning model was implemented by the researcher based on every step including: the study of learning model, technique for constructing the research instruments in collecting data from document and research studies in order to be guidelines for developing the learning model, implementation in every step of learning model development was considered by thesis advisor, and the recommendations and advice to be guidelines for improvement and correction in order to be complete and correct based on academic principle. In addition, it was presented to the experts in Educational technology in learning model. The evaluative findings, found that the mean value was 3.84, the Standard Deviation was 0.64. The evaluative findings in propriety, was in "High" level.

3.2 The mixed learning approach with the problem-based learning model for enhancing mathematics process skills of primary school students, could increase the effectiveness index to be = 0.7253. It was shown that the students' learning progress was = 72.53% which was in "High" level. Since the PBL was the model based on approach of Constructivism. The students constructed new knowledge from real problems being occurred in real world context of learning. It was supported by research study of King Mongkut's University Technology North Thailand (2002) that the learning approach by using the thinking process to solve the problems to be relevant to philosophy in educational management during the 21st century with the belief that the learning would be occurred when students could construct their own knowledge from prior knowledge or new obtained knowledge. In former time, teachers provided everything for their students as Passive Learning. Consequently, the students lacked of understanding and analyzing their real life problems. However, new learning style during the 21st century, the students

had to have Active Learning, be able to construct knowledge from their own understanding, and participate in learning more than in the former time.

3.3 The mixed learning approach with the PBL model could cause the students to improve their mathematical process skill in higher level than before learning at .05 significant level. Since the student-centered learning management provided the instructional management situation by using real problem to stimulate the students to search for answer through activities of group process. The teachers played their role as facilitator. As a result, the students had their thinking process skill from knowledge searching as well as construction in new body of knowledge by themselves. They had high level of motivation since they learnt from the problems which were specified boundary by themselves. The students were able to control themselves into learning. It was congruent with research findings of Nellman (2009) in "The Study of Blended Learning Model in Biology of Secondary School," found that the blended learning could help students to comprehend the content as well as had better problem solving skill at .05 significant level. Pong-sri Kiet-lerd-napa (1993) conducted research in "The Development of Problem-based Learning Model in Nursing," the findings found that there were significant differences between the experimental group students taught by problem-based learning, and the control group students taught by general learning at .05 level. There were significant differences in critical thinking between the experimental group students and the control group students at .05 level. The experimental group students' posttest scores were higher than pretest scores at .05 significant level. Besides, their posttest scores in critical thinking skill, were higher than the pretest scores at .05 significant level.

3.4 The students had satisfaction level in "somewhat satisfied" level. Since the constructed blended problem-based learning model by the researcher, could be applied in learning by being integrated during learning session of general classroom and the electronic studying with potentiality in lesson content. In addition, the problem-based learning model was to provide activities encouraging the students to be interested in as well as see the problem, able to specify the problems they wanted to know and learn, and be interested in searching for the answers. Besides, the teachers also provided various kinds of activities which were not boring. The students had opportunity to participate in activities more. Consequently, they were enthusiastic in learning because the blended learning activities provided more training practices than learning from theories. Furthermore, after content learning, the posttest was provided. The students could have immediate feedback continuously. So, they were happy to learn, and understood the Mathematical process skill. As a result, they had better learning achievement. It was congruent with research findings of Jinjo (2007) in "The

Development of Blended Learning Model in Computer Program Writing 1, in Business Computer," found that the satisfaction in developed blended learning model, was in "High" level. Since during learning activity management, the students' basic needs were emphasized sufficiently. The freedom and liberty were provided for students during learning which could promote the students' experience in knowing themselves in real situation during relaxed and free conditions. The learning environmental climate was provided warmly and safely. The teachers taught by suggesting and allowing the students to guide their own learning. They helped their students to learn conveniently until the goal was accomplished.

Recommendations

General Recommendations

1. Using the mixed learning approach with the Problem-based learning model, it was necessary to have preparation in many aspects since the instructional model was the teaching system based on teaching context through internet network. Therefore, the users had to consider and prepare to be ready in aspect of electronics teaching including: technology, staff, content, and environmental condition management for facilitating the students. In addition, the content should be designed to be interesting, motivate the learning achievement. The principle in designing the content, it was necessary for content to be produced by experts in content. Furthermore, it should be considered for the related persons to understand the steps and process of practice and usefulness for acceptance as well as preparation before implementation because the problem solving process would be occurred when the cooperation as well as acceptance very well by stakeholders from every division in order to cooperate in managing friendly and safe environmental condition management facilitating the learning and participating in activities.

2. The teachers and students using mixed learning approach with the problem-based model, had to obtain knowledge and competency in using basic computer, and information system through internet network system.

Recommendations for future study

1. There should be the mixed learning approach with the Problem-based model focusing on other aspects of higher order thinking, and practice skill development.

2. There should be the mixed learning approach with the problem-based learning model focusing on new technology usages to be foundation, for example, the instructional management through mobile phone or Mobile Learning.

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