Using the Instructional Developing System with the Blended Learning Model according to Project-Based Learning for Enhancing Problem-Solving and Using Technological Skills of Secondary Students at the Grade 9th under Mahasarakham Provincial Administrative

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Abstract

The objectives of this research study were: 1) to develop the instructional system with *Blended Learning Model* (BLM) according to the *Project-Based Learning* (PBL) was designed, and 2) to examine the effect of secondary students' learning outcomes of their using the BLM according to the BBL for enhancing their solving problems and technology skills under the *Mahasarakham Provincial Administrative Organization* were assessed. Research procedures were designed in three phases: Firstly; to investigate the 291-students' general background of their situations, problems, and needs to their 19-instructional teachers on Website Design issue was instructed, and in-depth interview with the 5-professional experts who indicated that were interviewed and evaluated with the *Questionnaire, Interviewing Form,* and *Factor Evaluating From* as the research instruments; Secondly, using the *Blended Learning Model*, *Web-Based Learning*, and *Various Scales* were validated and reliable by the 7-proferessional experts to assess students of their systematic development and certification were implemented; Finally, to describe the effects of the BLM after students' participating instructional model were instructed. Administrations to a

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sample size of 20 secondary students at the grade 9th level were instructed with the mixed learning designs according to the BLM and PBL-test for enhancing students of their developing solving problems and technology skills were used. Statistically significant was analyzed with Percentage, Mean, Standard Deviation, and Dependent Samples *t*-test.

The results of this research study have found that: students' responses of their situations, problems, and needs to develop the instructional system with *Blended Learning Model* (BLM) according to the *Project-based Learning* (PBL) was designed, which indicate that of the highest level were examined the effects of their learning outcomes to their using the BLM according to the BBL for enhancing their solving problems and technology skills were assessed that consisted of 5 factors including: 1) the context included of philosophy, vision, mission, and goal, 2) the input indicated that of the principle, objective, curriculum, blended instructional system, teachers, students, evaluation, and supportive system, 3) the processing steps evidence of three steps to the instructional management, such as: the preparation step; orientation, enrollment, pretest, and student's group; the instructional activity management composes of: the topic selection, the topic presentation, the project planning, the project implementation, the project conclusion and presentation, and the project measurement and evaluation. The measurement and evaluation step consists of the authentic assessment by providing the blended instructional system including the face to face learning and teaching, web-based learning and teaching, and augmented reality learning. 4) Students' responding outcomes of their problem solving skill, and technology skill. 5) Students' feedbacks of their problem solving skills to their technology skills with the professional experts revealed that of the propriety as the "High" level. In addition, it was found that the systematically efficiencies of the processing and resulting outcomes as specified standardized criteria as 82.21/82.75. 3. Students' perceptions of their instructions with the *Blended Learning Model* according to the *Project-Based Learning* toward their posttest assessments on the BLM in five aspects, which evidence of their solving problems, and focused on their pre-test and post-test assessments to their technology skills on the PBL, indicate that of seven aspects are differentiated as .01 significantly.

Keywords: The instructional system development , Blended Learning Model, Project-based Learning

Introduction

The National Economic and Social Development Plan, the 11th Issue (2012-2016), and The National Economics and Social Development Plan, and the 12th

Issue (2017-2021), on the basis of 20 Year National Strategy (2017-2036) were emphasized on human resource development to be perfect human beings based on Sufficiency Economy Philosophy into sustainable development of Thailand 4.0 in order to prepare human beings stepping into the 21st century, and move the national development by innovation and technology. Moreover, the National Education Act 1999, the Revised Issue (the Second Issue) 2002, and the Third Issue 2010, Section 4, the Educational Management Directions provided student-centered education to learn in every time and place. Therefore, the Ministry of Education supported the use of the computer as well as internet in learning and teaching as well as administration and management broadly for the most benefit in using information communication and technology systematically. (Srisaan , 2007: 1) It was supported by a model scheme of information communication and technology (The Third Issue) of Thailand 2011-2020 aimed for people to be knowledgeable, able to access as well as create and use information critically and knowingly, called Information Literacy. ICT should be used for major moving power in leading Thai people to knowledge and wisdom, Thai economic into sustainable growth, Thai society into equality (Department of Curriculum and Instruction Development, 2002: 10).

Most instructional management systems still are lecturing in class without media for learning and teaching. There was no systematic learning process for students to practice their problem-solving skill, technical skill, analytical thinking, synthetic thinking, critical thinking, creative thinking, considering and systematic thinking. The students didn't obtain the necessary knowledge and skill. They were not able to search for knowledge by themselves. They had no thinking skill, doing the skill, problem-solving skill. Consequently, the evaluative findings in students, were in "To be improved" level. In addition, the students' learning achievement based on Ordinary Educational Education Test or O-Net was in "Low" level. (The Office of National Education Standards and Quality Assurance, 2009: 3) It was congruent with Local Competency Test: LCT for secondary students at the grade 9th level , Thakhonyang Pittayakhom School, Mahasarakham Provincial Administrative Organziation, 2016 academic year, found that the mean value of communication skill was = 6.14 or 23.59%, the mean value of thinking skill was = 4.08 or 15.85%, the mean value of problem-solving skill was 5.41 or 20.87%, the mean value of life skill was 6.56 or 25.29%,the mean value of technical skill was = 3.83 or 14.40%. For overall of school level, Thakhonyang Pittayakhom School, the mean value in major competencies was 5.20 or 20.00%, which was lower than the standard level, in "To be Improved" level (Internal Audit System, 2016: 20).

Blending technology in learning and teaching for being relevant to learning society situation, the blended learning model was the integration of various

instructional methods systematically in teaching technique, teaching media and technology through instructional management in class as face to face, web-based learning and teaching, and augmented reality learning aimed for students' real practice (Kiranan, 2006: 1 ; Toomtong, 2013: 63) as well as Project Based Learning through learning process management of students as providers what they needed to learn based on the challenge and interest. It was a technique for enhancing the students to be able to think, do, solve the problem, and have their skill in using technology for knowledge searching. The teachers played their roles as facilitators only. They designed learning, provided questions to stimulate their students to think and practice. (Panich, 2013: 24) They could apply in designing the blended learning model by using project-based learning based on the researcher's specified approach. The project-based learning consisted of 6 steps including 1) the selection of title or topic for project, 2) the project topic presentation, 3) the project planning, 4) the project implementation, 5) the project conclusion and presentation, and 6) the project measurement and evaluation. (Department of Curriculum and Instruction Development, 2001; Pukiet, 2001; Trakulsarid, 2002; Dechakup, Yindesuk and Mesri, 2006; Satman, 2007) would be learning activities for developing the students' learning skill and competency in knowledge construction through workpiece from practicing in projects the students were interested in, and work practice in a real situation. The problem situations were arranged for students' opportunity in problem solving practice regarding project practice. As a result, the students would obtain problem-solving and technical skills.

According to the above significance and necessity, the researcher as educational staff in basic educational level, participated in student development of Secondary Education level, obtained the approach of blended learning model by project-based learning for enhancing secondary students at the grade 9th level problem solving and technology skills by using the blended learning model by project-based learning for enhancing secondary students at the grade 9th level problem-solving and technology skills, in order to increase students' learning efficiency and use as guidelines for conducting research further.

Objectives

1. To develop the instructional system with the *Blended Learning Model* (BLM) according to the *Project-based Learning* (PBL).

2. To examine the effects of secondary students' learning outcomes of their instructing the BLM according to the BBL for enhancing their solving problems and using technological skills under the *Mahasarakham Provincial Administrative Organization*.

3. To compare between students' outcomes of their pre and post assessment to their BLM according toward their BBL for enhancing their solving problems and using technological skills under the *Mahasarakham Provincial Administrative Organization*.

Methodology

The research on using the instructional developing system with the *Blended Learning Model* (BLM) according to the Project-Based Learning (PBL) Approach for enhancing problem-solving and using technological skills of secondary students at the Grade 9th under Mahasarakham Provincial Administrative Organization was designed that followed as the R&D research design. The paper section of this research administered on three phases;

Phase 1, the study of the current situation, problem, and need for blended learning model using project-based learning, was conducted through 1) the survey of the study of current situation, problem, and need of teachers and students, the analysis and synthesis of conceptual framework, the study of document, approach, and theory obtaining from searching from textbook, document, internet system, and related research literature in domestic and foreign countries, to be synthesized into basic information for developing the conceptual framework of the system, 2) the outline of the blended learning model by using the project-based learning for enhancing problem-solving and technological skills of secondary students at the Grade 9 th under Mahasarakham Provincial Administrative Organization, by the following steps: 2.1) the information from survey of current situation, problem, and need of teachers and students, and from the analysis, synthesis, rational, theory, and related document and research literature in Step1, was used as basic information for outlining the system, 2.2) the system was outlined based on the conceptual framework, and 2.3) the tentative system was presented to the thesis advisor for investigating the correctness as well as recommending the advice for being improved and revised. The research findings from this phase, the conceptual framework and tentative system were obtained for system development in the next Phase.

Phase 2, the development of blended learning model by using project-based learning, was implemented by three steps including 1) the system was drafted, the findings from data analysis in Phase 1 were drafted into system model, 2) the quality of system model was investigated by Connoisseur Expert Conference of 5 experts through the evaluation of factor and step in system drafting, the tentative system was improved according to the experts' advice, 3) the tentative system, evaluation form, and certified system form were presented to the 7-experts for investigating steps, factors, propriety, congruence of development in blended

learning model by using project-based learning as well as instructional activity, and certifying the tentative system. The tentative system was revised based on experts' recommendation. The instruments were developed based on the system as follows: the problem-solving skill test was constructed. The technology skill test was constructed. The lesson plan was drafted. The blended learning model using project-based learning, was developed. The quality evaluation form of less plan, was developed. The lesson quality evaluation form of blended learning model using project-based learning was developed for the experts. The lesson plan, the blended learning model using project-based learning, and the quality evaluation form were presented for being quality investigated by experts. Using the experts' recommendations for improving and revising. The findings from implementation in this phase, the quality tentative system, measurement instrument, lesson, and lesson plan of blended learning model using project-based learning for enhancing problem solving and technology skills of secondary students at the Grade 9 th under Mahasarakham Provincial Administrative Organization, were available for using in in the third Phase further.

Phase 3, the study of findings from the use of the blended learning model using project-based learning, was implemented based on the following steps: 1. Pretest, the samples were asked to respond to the tests of problem-solving and technology skills, 2. Implementation of learning activity management under blended learning model using project-based learning, for enhancing problem-solving and technology skills, which consists of the sample size as secondary students at the Grade 9 th with the Purposive Random Sampling technique was selected from 1 classroom out of 5 classrooms, 20 students for the experimental group, 3. The Posttest, after participated in every activity based on system, the samples were asked to respond tests of problem solving and technology skills. Data were analyzed as followed: 1. The data analysis for mean difference comparison, between the pretest and posttest in problem solving skill, was performed using the t-test dependent samples, and 2. The data analysis for mean difference comparison, between the pretest and posttest, was performed using the t-test dependent samples.

Results

1. The findings of current situation, problem, and need for blended learning model using project-based learning for enhancing problem solving and technology skills for secondary students at the Grade 9 th under Mahasarakham Provincial Administrative Organization, current situation, problem, and need for blended learning model using project-based learning, the teachers and students had current situation and problems in blended learning model using project-based learning, in overall, every aspect, was in Moderate" level. Besides, they had expectation in perception and need for blended learning model using project-based learning,

in overall, every aspect was in “The Highest” level. Every group thought that the developed system was very important to enhance the instructional activity to be more efficient.

2. The findings of blended learning model using project-based learning in enhancing problem-solving and technology skills for secondary students at the Grade 9 th under Mahasarakham Provincial Administrative Organization, found that the developed instructional system consisted of 5 factors including: 1) the context included philosophy, vision, mission, and goal, 2) the input included the principle, objective, curriculum, blended learning model, teachers, students, evaluation, and supportive system, 3) the process included 3 steps of instructional management including: the preparation step including the orientation, enrollment, pretest, and student grouping. The step of instructional activity management including the project topic selection, the project topic presentation, the project planning, the project practice, and the project conclusion and presentation. The measurement and evaluation step, was the authentic assessment by providing the blended learning model including: face to face instruction, the web-based learning, and augmented reality learning, 4) the outcome included the problem solving and technology skills, and 5) the feedback included the outcome of problem solving skill, and the outcome of technology skill. The experts viewed that the Propriety was in “High” level. Furthermore, the findings of technology skill, the efficiency of system was as specified criterion 82.21/82.75. The details of system were shown in Figure 1.

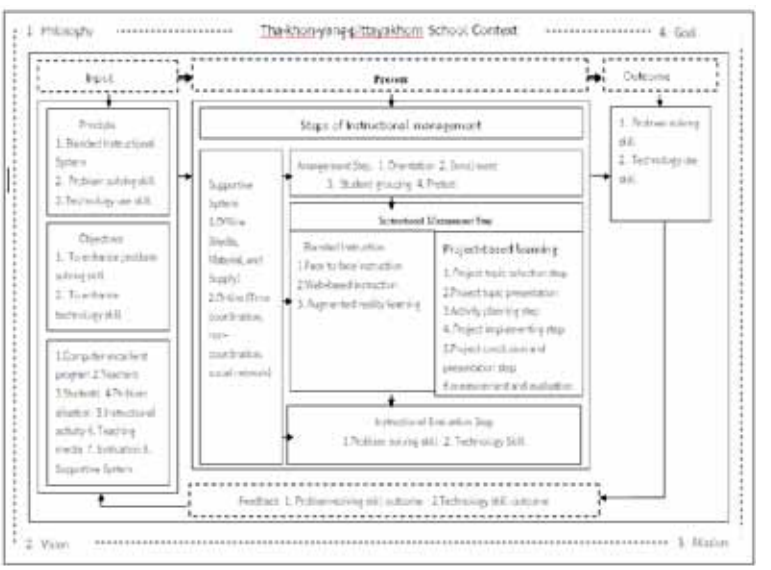

Figure 1: The blended learning model using project-based learning for enhancing the problem solving and technology skills of secondary students at the Grade 9 th under Mahasarakham Provincial Administrative Organization.

3.The findings of blended learning model using project-based learning for enhancing the problem solving and technology skills of secondary students at the Grade 9 th under Mahasarakham Provincial Administrative Organization.

3.1 The Mean value of blended learning model using project-based learning for enhancing the problem solving and technology skills of secondary students at the Grade 9 th taught by project-based, the posttests scores were significantly higher than the pretest at .01 level, as shown in Table 1.

Table 1: The comparison of Mean value in Problem-solving skill between the pretest and posttest of secondary students at the Grade 9 th taught by Blended Learning Model

Score of problem-solving skill	$\bar{X}$	S.D.	t	P
Pretest score	6.45	1.36	5.52	.000**
Posttest score	8.20	0.41		

**p< . 01

3.2 The Mean Average Scores from testing in technology skill between the pretest and posttest, found that secondary students at the Grade 9 th taught by blended learning model using project-based learning, the posttests scores were significantly higher than the pretest at .01 level, as shown in Table 2.

Table 2: The comparison of mean value in technology skill between the pretest and posttest of secondary students at the Grade 9 th taught by Blended Learning Model.

Score of Technology Skill	$\bar{X}$	S.D.	t	P
Pretest score	4.70	1.22	11.37	.000**
Posttest score	8.15	0.37		

**p< .01

Discussions

According to the tried out system, the findings could be discussed as follows:

1. The current situation, problem, and need for blended learning model using project-based learning for enhancing the problem solving and technology skills of secondary students at the Grade 9 th under Mahasarakham Provincial Administrative Organization, found that the current situation, problem, and need for blended learning model using project-based learning, the teachers and students

had current situation and problem of perception in blended learning model using project-based learning, in overall, and each aspect, was in "Moderate" level. In addition, they had expectation in perception and need for blended learning model by using project-based learning, in overall, every aspect, was in "The Highest" level. Every group viewed that the developed system was very important for improving the instructional activity management to be more efficient system. It was supported by Issac and Michael (1984).

2. The developed blended learning model using project-based learning, could cause the students to have higher level of posttest problem-solving skill than pretest at .01 significant level. It might be due to the learning model was developed according to principle of system management, the principle of blended learning between classroom learning and web-based learning. The students could learn by themselves from content in web throughout the time that could stimulate the students to be discovers and experimenters to practice by themselves. When there were questions in content and activity according to the step, the students could ask their teachers by managing their time through Augmented reality learning. Besides, they could also express their opinion as well as help with each other by communicating among students and teachers through the non-managing time, e-mail, chatting web board, and shared thinking. It was to promote and provide opportunity for students to develop guidelines for selecting the alternatives in solving various problems. The students could express their opinion or action from obtained learning. Therefore, they were able to solve the problem step by step systematically. It was supported by Joey (2006); Pansakul (2002); Prompan (2007); Bamrungcheep (2008); and Liamtaisong (2011), the good points of blended learning model by using project-based learning were presented for using in developing the students' problem solving skill. All of 6 activities were used as follows: Activity 1, The project topic selection. Activity 2, the project topic presentation. Activity 3, the project planning or proposal writing. Activity 4, the project implementation. Activity 5, the project conclusion and presentation. Activity 6, the project measurement and evaluation. It was congruent with findings of Reilly and Lewis (1983), Wallas (1962) ; Krulik and Rudnick (1993) ; Charles and Lester (1982) ; Torrance (1971) ; Guildford (1988), found that the activity management by using project-based, could improve problem solving skill.

3. The developed blended learning model using project-based learning, could cause the students to have higher level of posttest technology skill than the pretest at .01 significant level. It might be because the developed blended learning model by using project-based learning could affect the students' higher level of technology skill. Since it was the developed learning model based on principle of model management. The teachers encouraged and motivated the classroom learning activity through web board from both of management time and non-management

time by using all of 6 activities of learning activity using project-based learning as follows: Activity 1, the project topic selection. Activity 2, the project topic presentation. Activity 3, the project planning or proposal writing. Activity 4, the project implementation. Activity 5, the project conclusion and presentation. Activity 6, the measurement and evaluation. It was congruent with Reilly and Lewis (1983), Wallas (1962) ; Krulik and Rudnick (1996) ; Charles and Lester (1982), found that the learning activity by using the project-based learning could increase the technology skill.

Recommendations

1. General Recommendations

1.1 the blended learning model using project-based learning In blended learning model using project-based learning, the teachers and to arrange computer room to be ready and sufficient with the number of students. In addition, every set of computers had to be available for being used and connected with internet. The teachers had to monitor, suggest, and advise the students in order to be more efficient learning and teaching.

1.2 The teachers had to use new technology with instructional activity management for students' happiness and enjoyment in activity participation. As a result, the students would not be bored with, for instance, the Application Line Facebook should be used with instructional activity management for students' ability in sharing and expressing their opinion.

2. Recommendations for Future Research

2.1 The study of findings in blended learning model using project-based learning should be conducted with other variables such as the analytical thinking, synthetic thinking, critical thinking, and major competency of students with different class levels of students such as the Primary Education Level and Higher Education Level in order to develop guidelines for developing various ways and alternatives of instructional efficiency in higher level.

2.2. The research studies by using various systems of web-based lesson,system for developing the problem solving and technology skills, should be conducted for creating many alternatives to serve the students' different needs.

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