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Improving Communication Idea and Information, Problem Solving Skill Through Problem Based Learning

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The objectives of this paper were to develop the problem based learning in a project course for improving communication idea and information, problem solving skill for actual work in the workplace. Starting from analysis, design, development, implement and evaluation of problem based learning, identification of population and sample, implementation of problem based learning in project course for actual work in a workplace that was designed, with Phradabos's students who study in the project course I, and then collect data, analysis and conclusion. The result found that the competency was good level, the efficiency of problem based learning in project course was 83.30/82.13 that were above 80/80 established criteria, the advanced abilities after learning of students who learned from problem based learning in project course increased more than before learning, a knowledge and abilities of students were improved, the amount of students passing the project course I was 68.42%, which is higher than the previous time and almost project workpieces can meet industrial requirements.

Keywords: Communication idea and information, problem solving, competency, skill, problem based learning.

1. Introduction

Teaching and learning management for the vocational diploma program is consisted of basic courses, specific courses, elective courses, experience training and project courses. The project course is selected and taken by students for completion of the program. The outputs of project course I (3104-8502) were problem background, solving method, methodology, supporting data and presentation. However, these projects may not meet the needs for solving working problems in the actual industrial context. Therefore, this will affect vocational education quality and student's skills for working in the future. Thus, both educational and industrial sectors have cooperation for improving the project course to solve problems in the workplace. In the present many technical collage applied hand-on model, learning factories [1] and active

learning for learning and teaching.

Problem based learning: PBL was a part of active learning. PBL has since been extended in applications for other programs of learning and teaching. The process allows for students to develop their skills used for their future work. It increases critical appraisal, literature retrieval and encourages ongoing learning within a team environment [2]-[3].

Problem based learning has been applied in teaching and learning and suitable for project course. Phradabos school is operated by Phradabos foundation that is Royal project under the Royal initiative of King Rama 9, was established in 1966. The first aim of Phradabos school is help educational disadvantaged person, poor, unemployed and not enough basic knowledge to study at vocational institute but those people are interest in learning and have earnest perseverance, and the second aim is giving a opportunity in the professional and moral training for them are able to persuade a career, develop their own position, help family social and country. Phradabos school education is informal education that train in auto mechanic, electronic technician, electrician, sufficiency agriculture technician, maintenance technician, carpenter, welder and nursing home (H.S.) [4]. In Present Phradabos school has implemented the dual vocational training project, but student's learning achievement is low and not meet the requirements of industry. Based on the importance and previous studies about teaching and learning in project subject, the researcher has decided to develop the problem based learning in project courses for actual work in the workplace. One research question has been addressed: Can PBL use in the project? Problem based learning in a project course for actual work in the workplace consist of ADDIE-MIAP-7 steps of PBL model, lesson plan, chalk board layout, question list, teaching aids, exercises and keys, examination, assessment form of Vocational Education Commission and evaluation form. The main objectives of this research were as follows:

1) Develop the problem based learning in project courses for improving communication idea and information, solving problem skill.

2) Assess the communication idea and information, problem solving skill of students.

3) Evaluate the efficiency of learning of the problem based learning in project courses for actual work in the workplace.

4) Analyze advanced abilities of students.

5) Evaluate the industrial requirements for project workpieces of students.

6) Evaluate student's achievement.

2. Literature Review

A. Communication Idea and Information Skill

The problem solving skill is a complex skill that is one of key skills that are used in UK, Scottland and countries in United Kingdom, The national qualification framework (NVQs) was divided in 7 levels in UK which the competency in NVQs comprise of basic skill, common skill and key skill [5] but basic skill of AQF in Australia was called key competencies that comprise of collecting, analysing and organsing ideals, communication ideals and information,

planning and organizing activities, working with other and in teams, using mathematical ideals and techniques, solving problem and using technology [6]. In Thailand, it was called national qualification framework (NQF) that was divided in 7 levels same UK and the competency in NQF comprise of core skill and occupational skill which both skills were consist of knowledge, psychomotor skill or ability and attitude. The core skill consists of communication, calculation, using information technology, analytic thinking and problem solving and working in teams [7]. The key skill is a range of essential generic skills that underpin success in education, employment, lifelong learning and personal development. People are practical, applied skills relevant both. People in UK will often be developed through other subjects or main programmes but many people also be studied in their own right [8]. Communication idea and information skill comprise tasks that involve the different ways in which students communicate. Students need to be able to express themselves and to share ideas and information. This competency explores both verbal and written modes of communication [9].

B. Problem Solving Skill

The problem solving skill is a complex skill that is one of key skills that are used in UK, Scottland and countries in United Kingdom, The national qualification framework (NVQs) was divided in 7 levels in UK which the competency in NVQs comprise of basic skill, common skill and key skill [5] but basic skill of AQF in Australia was called key competencies that comprise of collecting, analysing and organsing ideals, communication ideals and information, planning and organizing activities, working with other and in teams, using mathematical ideals and techniques, solving problem and using technology [6]. In Thailand, it was called national qualification framework (NQF) that was divided in 7 levels same UK and the competency in NQF comprise of core skill and occupational skill which both skills were consist of knowledge, psychomotor skill or ability and attitude. The core skill consists of communication, calculation, using information technology, analytic thinking and problem solving and working in teams [7]. The key skill is a range of essential generic skills that underpin success in education, employment, lifelong learning and personal development. People are practical, applied skills relevant both. People in UK will often be developed through other subjects or main programmes but many people also be studied in their own right [8]. Problem solving skill involves with critical thinking, analytic thinking, decision making, creative thinking and information processing [10]-[12]. The three basic step of problem solving that for common job and life comprise of identify the problem, generate a list of possible solutions and implement the solution [13] and the five primary steps of careers in problem solving consist of analyze the causes to unwanted solution, generate the set of alternative interventions to achieve goals, evaluate the best solutions, implement a plan and assess effectiveness [14].

C. ADDIE Model

ADDIE was an instructional systems design (ISD) framework which many instructional designers and training developers use to create and develop courses. The name is an acronym for the five phases it defines for building training and performance support tools: 1) A: Analysis 2) D: Design 3) D: Development 4) I: Implement 5) E: Evaluation [15]

D. Problem Based Learning

Problem based learning (PBL) can be defined as a child-centered pedagogy in which students

learn about a subject matter and skills practice through the experience of analytic thinking, systematically thinking, problem solving, critical thinking and creative thinking an open-ended problem found in trigger materials that were prepared by instructor. The problem based learning (PBL) process does not concentrate only on problem solving with a defined solution, but it allows for the development of other desirable skills, attitude and attributes. This includes knowledge acquisition, enhanced group collaboration, numerical thinking, information and communication technology (ICT) and communication. The PBL process was developed for medical and nursing education and has since been extended in applications for other programs of learning and teaching [16]-[17]. The procedure of PBL allows for students to develop skills used in their future practice which should meet industrial requirements. It improves critical appraisal, literature retrieval and encourages ongoing learning within a team environment. The process of PBL consist of clarifying unfamiliar terms, problem definition, brainstorm, analyzing the problem, formulating learning issues, self-study and reporting [18]. PBL consist of driving questions or challenges, inquiry and innovation, 21th century skills, student voice and choices, feedback and revision and publicy presented product. Problem based learning (PBL) is similar to Project based learning (PjBL) which is a student-driven, "teacher-facilitated approach to learning. The teaching method in which students gain knowledge and skills by working for an extended period of time to investigate and respond to an authentic, engaging, and complex question, problem, or challenge. Both learning were applied to vocational and technical and engineering education for encouraging student's skills for 21th century: skills for the future [19]-[22].

E. MIAP Teaching Method

MIAP teaching method was used in learning and teaching for a long time in Department of Teacher Training in Mechanical Engineering, in Electrical Engineering and in Civil Engineering, Faculty of Technical Education, King Mongkut's University of Technology North Bangkok that well known in Thai-German. MIAP was known to be widespread in vocational and technical college of Thailand. The teaching technique is questioning which teacher must prepare question and answer list to help learning of students thus MIAP teaching method can be defined as a child-centered pedagogy. This teaching method consists of 4 steps as follows: 1) M: Motivation 2) I: Information 3) A: Application 4) P: Progression thus MIAP was integrated with 7 steps of PBL for this research [23].

3. Methodology

This research was an experimental research as shown in Figure 1. The research model followed the competency standard was transferred to be learning module which consist of performance criteria, range and evidences and ADDIE was integrated with 7 steps of problem based learning: PBL with MIAP that processing of MIAP using the questioning technique in teaching and learning so that the pedagogy was child-centered approach.

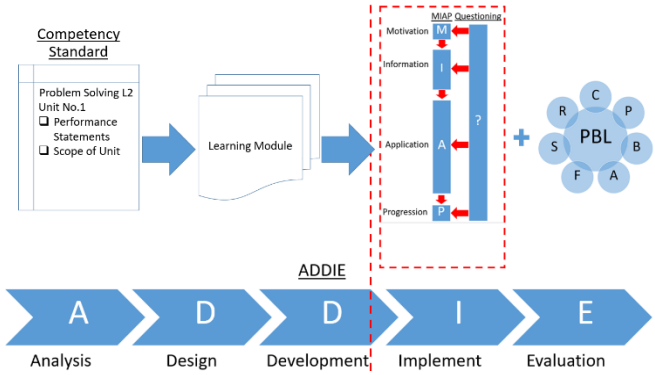

Figure 1. ADDIE-7 Steps of PBL-MIAP model.

First, the Phrada Bos students who studied in dual vocational training: DVT in 2nd year, the students must select the project topic for project course I (3104-8502) and taken by themselves or their group for completion of the DVT program. The communication idea and information skill and problem solving skill were trained in this course since project topics should meet the needs for solving working problems in the actual industrial context. The outputs of the project course comprise of problem background, solving method, methodology, supporting data and presentation thus previous competency were very important. PBL-MIAP was applied in I and E step of ADDIE. The student's behavior and background, dual vocational training context, communication idea and information skill, problem solving skill, project course I description, problem based learning and industrial requirements for improving communication idea and information, problem solving skill for Phrada Bos students were analyzed for learning and teaching and then design and development problem based learning (PBL) which integrated with MIAP teaching method: 1) Motivation 2) Information 3) Application 4) Progression, questioning teaching method and 7 steps of PBL that comprise of 1) C: clarifying unfamiliar term 2) P: problem definition 3) B: brainstorm 4) A: analyzing the problem 5) F: formulating learning issues 6) S: self-study 7) R: reporting. Almost Phrada Bos students as shown in Figure 2. They were poor but those people are interest in learning and have earnest perseverance.

Figure 2. Topics of project discussion.

F. Communication idea and information

The communication idea and information skill that was created from the both core skill of Thailand NQF and basic skill of NVQs. Topics in the course description of project course I were analyzed by coral analysis technique in order to sub-topics, main elements and course expected learning outcome: CLO that consist of knowledge, skills and attitude.

G. Problem solving skill

The problem solving skill that was created from the both core skill of Thailand NQF and basic skill of NVQs. Topics in the course description of project course I were analyzed by coral analysis technique in order to sub-topics, main elements and course expected learning outcome: CLO that consist of knowledge, skills and attitude.

H. Determination of population and sampling group

The population was students that worked in business and industry and studied at a diploma certificate level in dual vocational training (DVT). The sampling group were The 42th Phrada Bos's student who studied at diploma certificate level in project course I of the dual vocational training project were 76 registered persons but only 52 studied persons, diploma in industry were 34 persons and diploma in home science were 18 persons.

I. Topics analysis

Topics in the course description of project course I (3104-8502) were analyzed by coral analysis technique in order to course expected learning outcome: CLO that consist of knowledge, skills and attitude.

J. Creation of research tools

Research tools comprise of lesson plans, chalk board layout, question list, teaching aids, exercises and keys, examination, assessment form of the Vocational Education Commission that was assessed student's achievement, evaluation form which was used evaluated industrial requirements for project workpieces of students, document templates, laboratory, LINE group, Messenger application and computer room that shown in Figure 3.

Figure 3. Computer room for the project course I.

4. Results

The assessment of competency of problem based learning for improving communication idea and information skill and problem solving skill for Phrada Bos students who studied at diploma certificate level in problem based learning program. Phrada Bos's students were 52 persons. The communication idea and information competency unit comprise of C 2.1a, C2.1b, C 2.2 and C 2.3, the problem solving competency units comprise of PS 2.1, PS 2.2 and PS 2.3 for technician that are assessed and presented in table 1. The results presented of communication idea and information that the pre-test was fair level with average score 29.90 (S.D. = 4.43), the post-test was good level with average score 71.95 (S.D. = 5.16). The results presented of problem solving skill that the pre-test was fair level with average score 39.20 (S.D. = 7.02), the post-test was good level with average score 72.27 (S.D. = 4.32). The results revealed that problem based learning for improving communication idea and information, problem solving skill was good and student's communication idea and information, problem solving skill were good level and increasing.

Table 1. Assessment of competency of students.

Competency	Pre-test		Post-test	
	Averg.	Stdev.	Averg.	Stdev.
Communication idea and information				
C 2.1a [1]	32.67	3.69	74.65	3.90
C 2.1b [2]	30.77	4.67	72.12	5.27
C 2.2 [3]	29.67	4.85	70.00	5.21
C 2.3 [4]	26.48	6.52	71.24	6.27
Average	29.90	4.43	71.95	5.16
Problem solving skill				
PS 2.1 [5]	42.58	7.34	73.96	4.36
PS 2.2 [6]	37.96	7.10	71.73	4.55
PS 2.3 [7]	37.06	6.63	71.12	4.05
Average	39.20	7.02	72.27	4.32

[1] Take part in group discussion.

[2] Give a talk of at least four minutes.

[3] Read and summarise information from at least two documents about the same subject. Each document must be a minimum of 500 long.

[4] Write two different types of documents each one giving different information. One document must be at least 500 words long.

[5] Identify a problem, with help from an appropriate person, and identify different way of tackling it.

[6] Plan and try out at least one way of solving the problem.

[7] Check if the problem has been solved and identify way to improve problem solving skills.

The efficiency result of problem based learning for improving communication idea and

information, problem solving skill for Phrada Bos students compared between process efficiency (E1) and output efficiency (E2) is presented in table 2. The result of the efficiency of problem based learning for improving communication idea and information, problem solving skill presented that process efficiency and output efficiency E1/E2 was 83.30/82.13 that were above 80/80 established criteria. The result revealed that problem based learning for improving communication idea and information, problem solving skill can be used effectively in 2nd year internship and project course for diploma certificate Phrada Bos's students.

Table 2. Efficiency of problem based learning for improving communication idea and information, problem solving skill.

Evaluation	Total score	Average	Efficiency
E1	75	62.47	83.30
E2	50	41.07	82.13

Table 3 and Figure 4 showed that the scores measured and evaluated learning outcome of students between before studying and after studying by assessing the statistic t-test for dependence with significance at the 0.01 level. The advanced abilities after studying of students who studied from problem based learning for improving communication idea and information, problem solving skill increased more than before studying. As result t-test which was significantly different at 0.01 levels. The result founded that knowledge, skills and attitude of students were improved.

Table 3. Analysis of advanced abilities.

	N	ΣX	ΣD	ΣD^2	t
Pre-test	52	14.73	2001	54919	42.04**
Post-test	52	41.07			

Figure 4. Communication idea and information skill.

The Phrada Bos's student who studied at diploma certificate level were 52 persons who in problem based learning project. Table 4 presented that project workpieces were good level with average score 4.39 (S.D. = 0.65). The results revealed that problem based learning for improving communication idea and information, problem solving skill was good and student's

learning achievement were good level. Moreover, most of the project workpieces can meet industrial requirements.

Table 4. Evaluation of project workpieces.

	Ind.[1]	H.S.[2]	Aveg.	Stdev.
Appropriated design	4.42	4.50	4.45	0.57
Drawing & specification	4.37	4.40	4.38	0.62
Production	4.37	4.50	4.41	0.63
Valuation	4.37	4.70	4.48	0.63
Presentation	4.26	4.20	4.24	0.79
Supported document	4.26	4.30	4.28	0.75
Ethic & code of conduct	4.42	4.70	4.52	0.57
Average	4.35	4.47	4.39	0.65

[1] Industrial subject.

[2] Home science subject.

The result of table 5 presented that the Phrada Bos's students learning achievement were 52 persons which is high.

Table 5. Evaluation of student's achievement.

	Amount	Percentage
Admission	76	100%
Achievement	52	68.42%

The satisfaction of problem based learning (PBL) for improving communication idea and information, problem solving skill for Phrada Bos students consist of the computer room, laboratory, LINE group, Messenger application, essential theory, progression, document template, MIAP teaching method are shown in Figure 5 and the student's projects which improving the communication idea and information, problem solving skill of students and solving the working problem in actual industrial context that are shown in Figure 6. The result of the evaluation showed that problem based learning for improving communication idea and information, problem solving skill was good with average score 4.37 (S.D. = 0.56).

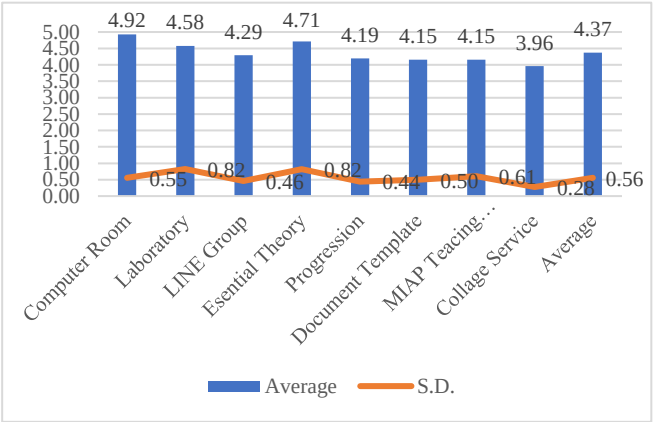

Figure 5. Evaluation of satisfaction of problem based learning in project course for actual work in the workplace.

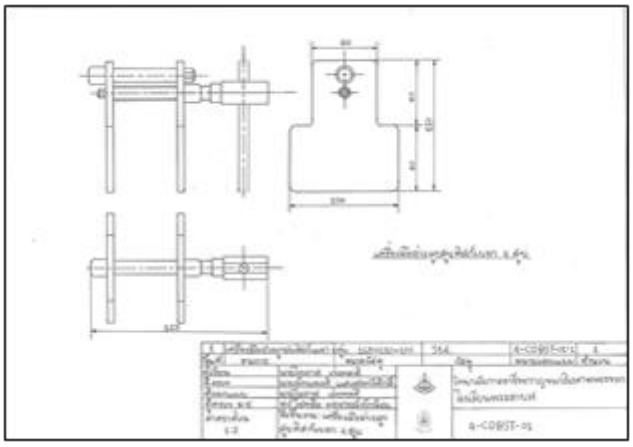

Figure 6. Drawing of special tool in project course for actual work in the workplace.

5. Conclusion

The implemented and finished the problem based learning for improving communication idea and information, problem solving skill for Phrada Bos students, the communication idea and information skill presented that the pre-test was fair level with average score 29.90 (S.D. = 4.43), the post-test was good level with average score 71.95 (S.D. = 5.16), problem solving skill assessment presented that the pre-test was fair level with average score 39.20 (S.D. = 7.02), the post-test was good level with average score 72.27 (S.D. = 4.32), the efficiency of industrial based learning for improving problem solving skill was 83.30/82.13 that were above 80/80 established criteria. The advanced abilities after learning of students who learned from problem based learning for improving communication idea and information, problem solving skill increased more than before learning and abilities that met their requirements were developed by PBL, the project workpieces were good level with average score 4.39 (S.D. = 0.65), Almost project workpieces can meet industrial requirement, the Phrada Bos's student learning achievement is 52 persons that is high and the evaluation of satisfaction of problem based learning in project course was good with the average score 4.37 (S.D. = 0.56). In the conclusion from the above results, the implementation of problem based learning for improving communication idea and information, problem solving skill for students can be completely used to learn for Phrada Bos's students in the problem based learning program. For the further, next time we will implement this method to improve others core competency.

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