A Problem - Solving Online Instructional Management to Enhance Problem Solving Competency in Fundamental Course of Electric and electronics for Industrial Certificate Students

Porssak Thongma*, Sorakrit Maneewanb and Sakesun Yampinijc

a*ptongma@gmail.com, b'porakrit.man@kmutt.ac.th, c'sakesun.yam@kmutt.ac.th

Abstract
This research was aimed (1) to develop the problem solving online instructional management for fundamental course of electric and electronics and to qualify the effectiveness of the instructional management (2) to study the learning achievement of the students who studied via problem solving online instructional model (3) to evaluate the learners’ activities and the problem solving competency using authentic assessment, and (4) to assess the students’ satisfaction toward problem solving online instructional model. The 40 diploma students of Electricity department of Anthong Technical College were purposive sampled. The findings of this study were as follow: (1) The online lesson gained the quality on content at the level of good and the media quality was at the level of “good” (2) the online media effectiveness was higher than the standard criteria of 80/80 (3) The authentic assessment via the practical job sheet and cooperative training gained the “good” level, and (4) the students’ satisfaction toward problem solving online instructional model was at the level of “much” good.

Keywords
Problem Solving Learning Management, Problem Solving Instruction, Problem Solving Competency

1. Introduction
The progress of science and technology affects social change and the people should always adapt themselves in learning styles. Education is important for a development because the education results to gain knowledge, solve the problems and develop the social in anyway. [1] National Education Acts B.E. 2542 second corrected edition, rule 22 says “Education System Management must believe that all the students can learn and develop themselves. The students are the most important. The educational management must encourage the students grow up naturally and potentially”. About the instructional management in rule 24 identify that the education institute or school should manage the content and activities harmonize to the students’ interesting and their skills. The educational management should provide for individualization, practicing the students’ skills, thinking process, management, encounter the problem situation and apply the knowledge for problem protecting and solving. The learning activities should concern the real experience, learning practice, think and to do fluently. The habitation of reading and eager to learning are included. In addition, it should promote the teacher to create the atmosphere, environment, media, and facilities to gain the students’ knowledge and learned. Moreover, the learning process should apply the research as in the activity. The students and the teacher can altogether learn from any learning resources.

The learning process should occur anytime, anywhere, any place. The parents and community in social should cooperate to develop the students toward their potential.

The Vocational Education Commission (VEC), Ministry of Education, is the main organization that has the responsibility for vocational education and career training management to develop manpower in semi-skill, skilled labor, technician and technologist. The vocational graduates should gain the vocational competency. The government and private school should cooperate with the workplace to manage the vocational education to gain the standard and harmonize the economy and social national plan, the national education plan. The philosophy of vocational education under the umbrella of sufficiency economy in providing the resources is to produce the potential manpower for developing country. [2]

The Vocational Education Commission is also pay attention in finding, developing and diffusing the innovation and technology to develop the student’s career in commercial context. In the vocational certificate curriculum, using the Vocational Education Curriculum B.E. 2545 (Adapt 2546) is developed for improving the students’ skill in specific field of study in the skill labor level that can work and response to the workplace and can also being the owner of the workplace harmonize with the national economy and social condition both in the domestic and national level. The vocational instruction focuses on students’ practice in the real situation, practice in problem solving from the real situation, learning from any learning resources, and using technology in the learning process.
1. The student centered approach is used in vocational education system. The students are provided the real experience in practicing in the field of study under the concept of learning by doing. The learning process is to produce the student who has an analytical thinking, synthesize skill, creative thinking, learning skill, qualification, being a smart, good member in social.

   Problem Based Learning: PBL is one of the educational innovation derived from medical school. The PBL is applied in educational system to practice the students in solving the problem and learn the process what they solved. The students can direct their way to learn (Self-directed learning). The PBL is one of student centered approach, not teacher centered that is content based learning. The students learned by PBL will gain the skill of problem solving and practice thinking, searching information and learned by the process of problem solving. The PBL is the strategy of instruction that encourage the students in thinking process systematically. The students will gain knowledge by doing in real situation while the teacher is the facilitator in learning process.[3]

Online network instruction is benefit for the students because it can learn anytime, anywhere or we can say it is ubiquitous. The instruction or learning activity is not only in the classroom or in the time schedule, the students can share their opinion or discuss among the friends. The students can review the content learned by him or herself, do not disturb the other student. The online network instruction is also stimulus the students to learn because the technology in online network instruction will motivate the students in learning. The students can discuss with the teacher, friends and the experts. It is the opportunity of the students in different places to share or discuss their knowledge. The teacher can also develop and update the content toward the technology. The students can openly communicate and share knowledge freely. The content is more flexible than the typical technique. This new approach leads to response the students need and the student centered approach.

   Natthawadee Nanthapinai [4] mentioned the problem solving concept of 2 steps. It consists of 1) Construct Problem Representation, the process in trying to understand the problem by connecting with the prior knowledge and create the representative of the problem and 2) Search for Solution, the finding of problem solving that use understanding, analysis the relationship of the identified situation in that problem, create the format of solving, solve the problem and evaluate the problem solving.

   Julian et. al. [5] confirmed the case study using problem solving activity that can support the students in problem solving. The expert’s characteristic is taken to use din the learning process. The characteristics are as follow:

   1) Focus on The Big Picture: the expert or teacher has the format of problem solving by considering the concept as the students who do not have format of problem solving which look out only the surface. By the case study, the knowledge is under the complex problem structure. This is the opportunity of the students to be trained in connecting the new experience and the prior knowledge under the condition of real situation.

   2) Work Forward from What They Know: the expert or teacher begin to work by the own experience, identify the assumption and find the information to test the assumption. On the other hand, the students focus on the new experience that they do not know. The students find the knowledge to fill the space. In the case study, the view of problem situation will be summarized by the students and try to do the best to use the information and leads to make a framework of problem solving and find the answer.

   3) Simultaneously Consider Multiple Factors: the expert or teacher mostly like to overview the problem and consider the construction of the problem components which concern and interact with that situation while the students can only view one component. By the case study, the students can look through the complex problem situation and the movement on it.

   4) Generate Tentative Solutions: Both the expert (teacher) and the students start to create many answers of basic in problem solving process.

   5) Consider Potential Consequences and Implications: the expert or teacher can thoroughly think to suggest the students step by step and identify the result of problem solving. For the students, they can consider the alternative answers that benefit and least risk.

The fundamental of Electric and Electronics is the basic course of industrial vocational curriculum. The students of industrial field such machine technology, metal technology, include electric and electronics. The content identified in the curriculum description are too much to deliver to the students on time in one semester. The researcher realized the advantage of Problem Based Learning: PBL which can stimulate the students by assign the knowledge and skill construction by PBL. The PBL is focused on the responsibility of the student, and the knowledge construction. The students present the problem, the need of problem solving using the basic real situation or simulation but the students have to solve the problem from real situation, learning resources and practice skills and identify the step of problem solving. So the researcher decided to use online PBL in this study.

2. Research Objectives

   1. To develop the problem solving online instructional management for fundamental course of electric and electronics and to qualify the effectiveness of the instructional management

   2. To study the learning achievement of the students who studied via problem solving online instructional model

   3. To evaluate the learners’ activities and the problem solving competency using authentic assessment

   4. To assess the students’ satisfaction toward problem solving online instructional model.

3. Research Scope

   1. Population: the 40 students of electric and electronics students who were registered the course of fundamental in Electric and Electronics were the population in this study.

   2. Sample: the 20 students of electric and electronics students who were registered the course of fundamental in Electric and Electronics were the sample in this study.
2. Samples: the samples were divided into 2 groups
   2.1 The first samples were 30 students for studying the quality of the research tools.
   2.2 The second samples were 40 students who registered the course of fundamental in Electric and Electronics to study the learning achievement and satisfaction by online network instruction.

4. Research Variables
   1. Dependent Variable: the problem solving online instructional management for fundamental course of electric and electronics
      1.1 Learning Achievement - problem solving competency
      1.2 Students’ satisfaction on problem solving online instructional management for fundamental course of electric and electronics
      1.3 Authentic assessment

5. Research Tools
   1. The interview form of problem solving online instructional management for fundamental course of electric and electronics
   2. Online lesson of fundamental course of electric and electronics via network.
   3. The test for problem solving (for experts in test quality)
   4. Content and media evaluation test (for online lesson quality)
   5. Problem solving test for students
   6. Students’ satisfaction evaluation form

6. References
   [1] Paramee Samritsuth, 2551, A study of learning achievement of science and problem solving on science of Mathayom Suksa 6 students by self-study. Thesis for a master degree of education, Srinakarinwirot Prasarnmitr University Graduate School