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Development of Critical Thinking and Learning Achievement of Project-Based Vocational (PBL) Students in the Introductory Microcontroller Course

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Abstract

This research aimed to 1) develop the analytical thinking ability of vocational students by using a project-based model in the introductory microcontroller course 2) studying the students' learning achievement in the introductory microcontroller course. 3) The satisfaction of learners with the Microcontroller courses. Target groups in this research 3rd-year Vocational Certificate students in Electrician work field Khon Kaen Technical College, Semester 1, Academic Year 2020, has 1 classroom, 20 students using the purposive sampling method. This research is action research. The research instruments were 1) a critical thinking ability test 2) a learning achievement test 3) a student satisfaction assessment form based on project-based learning. The tools used to reflect the research results were: 1) Project Based Learning Management Practice Voucher 2) Pre-study test for each activity 3) Post-study test for each activity. The research results were found that summarize the research results of the development of analytical thinking skills and learning achievement of students at the Project Based Vocational Certificate (PBL) in the introductory Microcontroller course. Has a statistical significance of 70% of the full score at the .01 level and has achieved 60% of the full score in all units, statistics at the .01 level.

Keyword: Critical thinking, Problem based learning, Micro controller,

1. Introduction

Project-based learning is a student-centered approach to teaching and learning. Having specific learning or learning objectives based on a self-defined project allows learners to be more independent. Can learn what they are interested in it creates motivation for learners and takes more responsibility for learning.

It also encourages learners to practice skills in their operations. Learners know how to work systematically and have a good plan, have the opportunity to practice the process of acquiring knowledge.

As well as students are creative and able to use them in real life in terms of systematic and creative ways of working. Therefore, project-based learning is one of the learning methods most teachers choose to implement in their teaching and learning to foster creativity in students [1]. It is a learning process that starts with the students to choose or name a project to study by themselves according to their interests.

Project preparation operational planning building tools used for data collection. The implementation of the project as planned including collecting information, data analysis, writing a project report and presenting the results of the project.

When it comes to critical thinking skills that mean ability to contemplate meditate on cause and effect by distinguishing consider for the correctness and clarity, not just an analysis by distinguishing significance. One-sided relationship and principle. But all aspects must be considered deeply. By Bloom defines critical thinking skills as the ability to multiply. Sub-events, stories of various content. It is carefully thought based on evaluation principles and has reference evidence.

To draw conclusions as well as consider all

relevant elements and use the logical and logical processes reasonably. And when considered, we will find that in that aspect is important to critical thinking because critical thinking is a skill that promotes learning and allows learners to expand their knowledge [2].

Their own experiences and thoughts are broad and deep, so education management for the development of people in the present era. Therefore, organizing a learning activity to equip students with critical thinking skills is more difficult than organizing learning activities for students to remember facts [3].

Especially, practical occurring often the problem of the environment in the laboratory is devices which are large, expensive and limited. Therefore, the teachers need to prepare a variety of tools, equipment and more. Besides, some teachers may not have expertise in analysing the material, content, preparing devices or cannot find the proper devices in the experiment. To face problems in buying equipment and providing the right equipment for the content of learning and practicing the skills they need for purpose. It takes longer to prepare or have the time and skills to train students [4-6]. Another important reason that makes the learning achievement of the students remained poor is effectiveness of media and the lack of experimental kits. The experimental kit is important that the media has been used to study the theory and to expand knowledge by learning practical in the simulation experience for offering opportunity to learners practicing their brain and body together from learning to practice experiments. Lacking media for teaching and learning is the important problem of managing for teaching and learning. This problem affects to the learners that are unable to do the chronology, the concept that the things which are invisible to the eyes. The learners cannot study explicitly. To develop knowledge form listening teacher is not enough for learning; therefore, teaching practical part, preparing learning activities and proper learning media for developing knowledge and capabilities, and practicing efficiently is important for learning [7-9].

2. Method of conducting research

The sample used in this research is 3rd-year Vocational Certificate students in the Electrical power work field Khon Kaen Technical College Semester 1, the academic year 2020 has a total of 1 classroom Number of students 20 people, using a specific method of selection (Purposive sampling), the reasons are as follows.

1) It is a college where students have different

talents and elements from other colleges.

2) Is a school that provides teaching and learning according to the Vocational Certificate Program, B.E. 2556.

3) It is a college equipped with technology and computer labs as well as a series of experiments that facilitate teaching and learning.

4) It is a college that has enough equipment for the number of students.

This research is experimental research that used a research plan for one group pretest-posttest design (One Group Pretest Posttest Design).



Fig. 1 Hardware for proposed system.

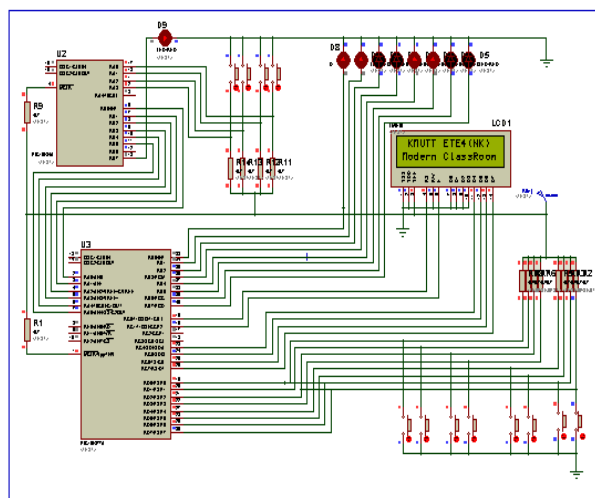


Fig. 2 System outline

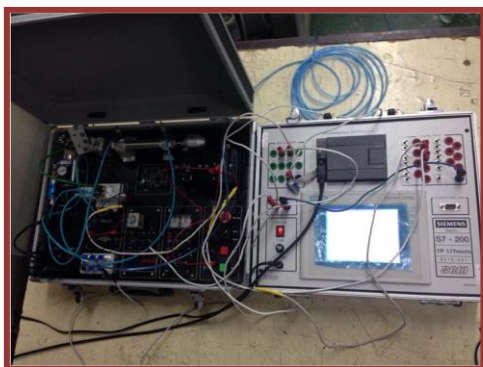


Fig. 3 Laboratory Set

3. Research Results

According to the research results from the comparative study of academic achievement between conceptualization and conventional teaching approaches through the academic achievement test of 40 questions with 4 multiple choices, the score was measured by t-test statistical method for 2 independent groups. It was found that students from experimental and control groups showed different academic achievement at the statistical significance of 0.01 level. This means that students from the experimental group showed higher academic achievement than those from the control group. Problem based learning approach could help students from the experimental group gain higher academic achievement than conventional teaching approach [11-13].

According to the analysis of Table 3, it was found that the t value was statistically significant (0.01, df = 38). The t value from the table was 2.457 and the t value from calculation was -4.47. This means that the learning achievement for pretest and posttest of the control group was statistically significant. Students with conventional teaching approach showed difference in their pretest and posttest learning achievement.

Table 1: shows the mean, standard deviation and t-test of the posttest learning achievement for both experimental and control groups.

Sampling group	N	X	S.D.	t-value
Experimental group	20	23.35	1.49	3.38 **
Control group	20	21.85	1.31	

** Statistically significant at the 0.01 level

According to the analysis of Table 4, it was found

that the t value was statistically significant (0.01, df = 38). The t value from the table was 2.457 whereas the t value from calculation was 3.38**. This means that the learning achievement for posttest of the experimental group and the control group was statistically significant. In other words, the students with principle teaching approach showed higher learning achievement than students with conventional teaching approach [4].

Table 2: shows the mean, standard deviation, t-test value of posttest learning achievement of experimental and control groups as classified by learning behaviors

Learning behaviors	Experimental group			Control group			t-value
	N	X	S.D	N	X	S. D.	
Memory	20	17.8	1.7	20	13.2	2.4	-3.497 **
Understanding	20	17.2	2.31	20	12.8	4.30	-2.015
Application	20	17.2	2.81	20	13.8	3.54	-2.814 **

** Statistically significant at the 0.01 level

According to the analysis of Table 5, it was found that the t value was statistically significant (0.01, df = 38) The t value from the table was 2.457 while the t values from calculation were -3.497 -2.015 and -2.814 according to learning behaviors as in memory, understanding and application. The mean of the experimental group was higher than the mean of the control group. This means that students with principle teaching approach showed higher learning achievement on the topic of a introductory microcontroller course than students with conventional teaching approach.

4. Conclusion

According to the research on the learning achievement between the experimental and control groups through learning achievement test of 30 items with 4 multiple choices, the scores were analyzed using t-test technique with 2 independent sampling groups and it was found that the experimental group and the control group showed statistically significant difference in their learning achievement at the level of 0.01. The experimental group showed higher learning achievement than the control group. Therefore, the principle teaching approach could help the experimental group students gain better results than the control group with conventional teaching approach.



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