***The Development of a Motor Control Experimental Set Through
a Virtual Reality Program by Using Active Learning***

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Abstract

The development of a motor control experimental set through a virtual reality program by using active learning. The objectives of this research for 1) Develop a motor control experimental set of operating the motor control circuit 2) Develop an active learning management through a virtual reality program 3) To evaluate the achievement of an active learning management to develop a practical skill 4) To assess the ability of operating the motor control circuit. The statistics for analyzing tool quality are accuracy and the statistics for analyzing the data were mean, standard deviation and percentage. The results showed that 1) The development of the motor control experiment set that was created had a validity or accuracy (IOC) score that passed the criteria, with the average IOC being 0.67-1.00. 2) an active learning management through a virtual reality program 3) The overall quality of activities was at a good level (mean = 4.50, S.D. = 0.81). When considering each aspect, it was found that it was at a very high level, with the highest mean being "learning media (mean = 4.75, S.D. = 0.38) 4) The students' practical skills for motor control circuit passed the criteria, representing 82.60 percent and for the target, 80% of the people are pass the criteria.

Keywords: Virtual Reality Program, Active Learning, Motor Control

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Introduction

The direction of national development in the National Strategy (2018 - 2037) has set important development goals to develop people in every dimension and at every age to be good people smart and quality. Thai people are physically, mentally, intellectually, prepared and have good all-round development, be responsible to society and others, have discipline, maintain morality and be a good citizen of the nation, have the correct principles. Gain essential skills in the 21st century, such as the ability to practice problem solving, adapt, communicate, and work with others more effectively, have a habit of continually learning throughout life. The national strategy (2018) The National Education Plan (2017 - 2036) has specified human resource development as a very important mechanism for bringing the country into the 21st century global society and is a main issue specified in the national strategy and the Thailand 4.0 strategy. Preparing manpower in terms of knowledge and skills Essential competencies such as analytical thinking Ability to solve problems, communicate and work as a team, etc. in order to be aware of the changing trends of the dynamic world. National Education Plan (2017) determine characteristics or indicators of practical ability and learners have self-confidence [6] Praphasara Kotakhun (2012) Learners gain knowledge and understanding from direct experiences, resulting in clarity clearly from the learning experience, bring coping skills, finding ways to solve problems and make decisions will be useful in applying them to life [4] Tisana Khammanee (2007). It can be seen that practical ability is an important skill that should be developed for students along with learning outcomes in various subjects. From the study of methods for developing practical ability, it was found that there is a demonstration learning method. There is an idea according to the concept of [5] Tisana Khammanee (2008) said that the teaching method using demonstration is a process that teachers use to help students learn according to the objectives specified by showing or doing things that the students want to learn, let the learners observe and then have the learners ask questions, discuss and summarize the learning gained from observing the demonstration teaching and the demonstration was divided into teaching steps as follows: 1. Demonstration preparation step 2. Demonstration step 3. Learning activity organizing step. 4. Summary and evaluation stage [1] Jaruwan Toontham (2016) has organized learning with a demonstration model to increase learning achievement and practical skills in using an oscilloscope in Bachelor's degree in Computer Engineering class. The research results found that higher than the 80% threshold with statistical significance at the 0.01 level [1] Jaruwan Toontham (2016) and there is also research by [7] Worawat Promden (2018) that develops basic scientific process skills by teaching a demonstration of operations of the physical changes and chemical changes of Grade 5 students, the results found that organizing learning through hands-on demonstration teaching can develop necessary skills for students. Including making students have important skills that learners in the 21st century need to have practical skills [7] Worawat Promden (2018) Therefore, it can be seen that the demonstration learning method is another one method that can promote practical ability.

From the importance of practical ability and how to solve problems by teaching the above demonstrations. Therefore, the researcher is interested in researching the development of a motor control experiment kit through a virtual reality program by using Active Learning to develop hands-on motor control circuit skills in the electric motor control subject. The advantage of demonstrating through the program is to simulate experiments compared with practice. It is expected that after receiving the learning management, the students will have learning behavior as targeted in the curriculum and in addition [2]. Chusak Plianpu (2002) Using experimental sets for teaching will make the teacher and students interact more by giving advice from the teacher. Students will also practice solving problems on their own and

have the discipline to work and be a team. This will help the learners to have the qualifications that the establishment needs and apply this knowledge to their next career.

Research Objective

1. Develop a motor control experimental set of operating the motor control circuit
2. Develop an active learning management through a virtual reality program
3. To evaluate the achievement of an active learning management to develop a practical skill
4. To assess the ability of operating the motor control circuit

Research Hypotheses

H1: The accuracy or precision of the motor control experiment worksheet for developing a motor control experiment set for operating the motor control circuit passes the criteria.
H2: Active learning activities through a virtual reality program (Simurelay) to develop skills in operating electric motor control circuits by hand in the subject of electric motor control in very good level.
H3: After learning with Active Learning activities through a virtual reality program (Simurelay) to develop skills in operating motor control circuits by hands at least 80 percent.

Research Method

Participants

The population and samples in this research are 20 students from 2nd year undergraduate students in the Bachelor of Technology program. Electrical Technology Major: Faculty of Industrial Education and Technology King Mongkut's University of Technology Thonburi Academic year 1/2022 by sampling by purposive method.

Research Instrument and Procedure

In the research study on the development of motor control circuit construction using Active Learning through a virtual reality program (Simurelay) to develop motor control circuit operation skills by hand in the subject of electric motor control is a research/experimental type by using a preliminary experimental research design with a single experimental group to measure results only after the experiment (The One-Shot Case Study Design, posttest-design) according to the concept of [6] Pariwat Khueankaew (2008) with the following steps: Method Build and quantify each tool. The aim/topic of the experiment worksheet is specified consisting of a total of 5 worksheets, study theories, concepts, documents and various research studies in order to understand the principles of creating experimental worksheets and create a motor control experiment worksheet to develop skills in operating electric motor control circuits by hand. From the desired indicators according to the objectives, which are based on the main idea, choose to develop learner indicators and present the created experimental work sheets to experts. The content validity assessment form (IOC) allows experts to consider validity (Validity) according to the content or consider the consistency between the questions and the objectives (Item-Objective Congruence: IOC).

1. Motor control worksheet: To develop skills in operating electric motor control circuits by hand.

2. Model to evaluate the quality of Active Learning activities through a virtual reality program (Simurelay) to develop skills in operating electric motor control circuits by hand in the subject of 5 aspects of electric motor control.

3. Measurement of practical ability using a motor control experiment worksheet. To develop skills in operating electric motor control circuits by hand with a total of 5 manual motor starting experiment worksheets, with 3 indicators.

Experimental Design

Organizing demonstration learning to develop skills in operating electric motor control circuits by hand, subject of electric motor control. The researcher conducted an experiment with a convenience random sample of 20 people using a single-group experimental research design, measuring only the results after the experiment (The One-Shot Case Study Design, posttest-design) according to the concept of [6]. Pariwat Khueankaew (2008) as follows:

ผังการทดลอง E-Group
$$\boxed{\quad X \qquad O \quad}$$

Figure 1: The experimental design

In writing the experimental diagram, various symbols are used to convey the following meanings.

E-Group = Experimental group of 20 people.
X = Experimental variable of Active Learning through a virtual reality program (Simurelay).
O = Variable based on skills in operating electric motor control circuits by hand.

Data Analysis

1. Analysis of the quality of research tools

Analyze the validity or precision. By calculating the consistency between the questions and the objectives (Item Objective Congruence: IOC), the validity evaluation form of all 5 experimental worksheets from content experts by having quality assessment experts calculate the IOC values.

2. Objective data analysis and hypothesis testing

2.1 Analyze the quality of demonstration learning activities to develop operating skills in manual motor control circuits to check the research hypothesis that the quality is at a better level." Analyze the quality data of the activities obtained from the evaluation of experts by finding the average and calculating the standard deviation. The average is then compared with the average range to determine the quality level. Acceptable values are better level which has an average range of 3.50 - 4.49 with good quality.

2.2 Analyze the scores of the experimental worksheet to develop operating skills in manual electric motor control circuits in the subject of electric motor control to examine the research hypothesis stated. "After learning with Active Learning activities through a virtual reality

program (Simurelay) to develop skills in operating manual motor control circuits in the subject Electric Motor Control. Not less than 80 percent or more according to the assumption.

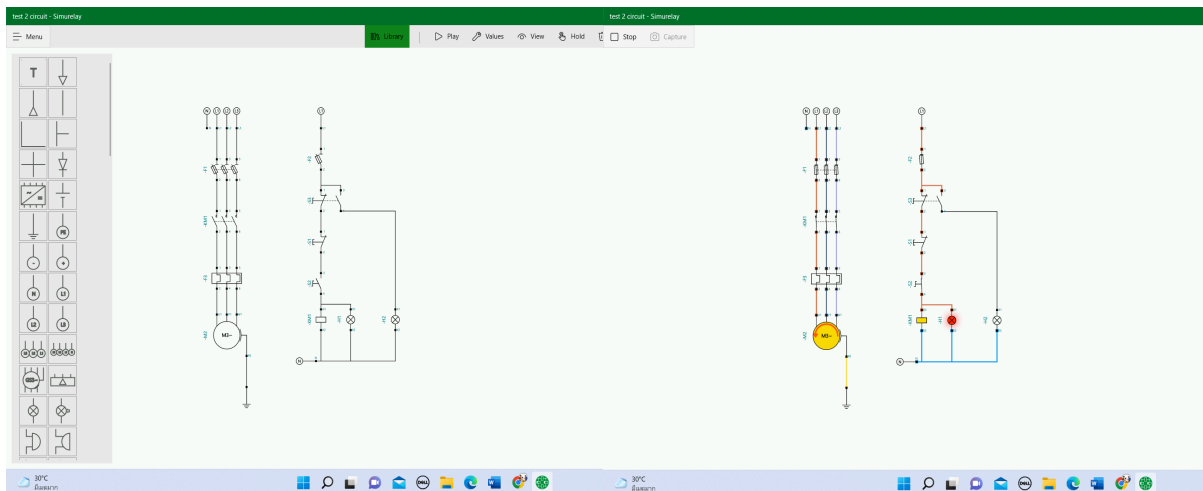Figure 2: Manual operation of electric motor control circuit

Figure 3: Active Learning through virtual reality programs (Simurelay)

Statistics Used Data Analysis

Precision values using the formula for finding consistency values: IOC (Index of Item Objective Congruence), mean, standard deviation (SD), percentage.

Conclusion

1. Developing motor control worksheets to develop skills in operating hand-on motor control electrical circuits. The accuracy or precision (IOC) scores of the motor control worksheets passed the criteria for all 5 experimental worksheets by the average IOC will be 0.67-1.00. It is considered that the stated assumption is "the validity or reliability of the motor control experiment worksheet to develop skills in operating electrical circuits to control motors by hand, passing the criteria (score 0.50 and above)."

2. Development of a motor control experiment set through a virtual reality program using Active Learning in the subject of electric motor control. The sequence of steps in training is as follows.
    Step 1: Creating Interest
    Step 2: Provide knowledge to students on each of the 5 experimental worksheets. Divided into 1 worksheet per week.

Step 3: Practice readiness for practice. The instructor will distribute experimental worksheets each time for students to study the working principles of various types of motor connections.

Step 4: Train your ability to practice. The instructor divides the students into groups of 2-3 people, totaling 7 groups. Then the students complete an experimental worksheet and the instructor demonstrates through a virtual reality program. (Simurelay) where students conduct experiments by using circuits from worksheets to experiment through a virtual reality program (Simurelay) and compare with the results of manual training.

Step 5: Summary of the lesson: The teacher works to summarize the content by summarizing each worksheet separately and having the students explain the principles of their work.

Step 6: Measure students' ability to practice connecting circuits from all 5 experimental worksheets.

3. The overall quality of learning management activities is at a good level (mean = 4.50, S.D. = 0.81). When considering each aspect, it was found that the level was excellent level in every aspect, with the aspect having the highest average. From highest to lowest, the top 3 are: "Learning media (mean = 4.75, S.D. =0.38), followed by the learning activities aspect (mean = 4.73, S.D. =0.46) and the overall structure of the plan (mean = 4.53, S.D. =0.81) were considered consistent with the set assumptions.

4. Results of the study of the ability to operate the electric motor control circuit by hand. Shows the percentage of ability to operate the manual motor control circuit, each group, totaling 7 groups, as shown in Table 1.

Group	Target score (total 155)	Result		Percentage
		Pass	Not pass	
1	123	√		80.35
2	133	√		85.80
3	123	√		89.35
4	126	√		81.29
5	129	√		81.22
6	140	√		80.32
7	140	√		80.32
Groups that pass the criteria		7		82.60

Table 1: the percentage of ability to operate the manual motor control circuit by hand

The target group's score was calculated from the results of the evaluation of 5 worksheets and from the experiment of students with skills in operating electrical circuits to control motors by hand, passing the criteria, accounting for 82.60 percent. As for the target, there were 80 percent who passed the criteria, considered consistent with the assumptions specified. That is, after learning with Active Learning activities through a virtual reality program (Simurelay) to develop and develop skills in operating electrical circuits to control motors with hands, subject of electric motor control.

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