

How to using the DAPOA Project-Based Learning Model for Sensor Devices and Its Applications

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Abstract.This objective of research presents the using the DAPOA project-based learning model to apply in the teaching of sensor device and its applications course. The DAPOA project-based learning model consists of 5 activity processes such as 1) Determination 2) Analysis 3) Planning and Design 4) Operation and 5) Assessment. The research tools used in the implementation are an instructional package and assessment form. The samples were 27 students in electrical industrial technology. The results found that the students' satisfaction was very high level (mean equaled to 4.54) and the DAPOA project-based learning model had efficiency which was in accord to the standard criteria of Meguigans's formula. In conclusion, the DAPOA project-based learning model can be used appropriately in the teaching of technology course or related as well.

Keyword: Project-Based Learning, DAPOA Learning Model, Sensor Device and its Applications

I. INTRODUCTION

Currently, Technologies in 21st century are changing rapidly and have a great effect on the country's economy. Meanwhile Thai government's vision is focused on becoming a value based and innovation-driven economy by moving from producing commodities to innovative products emphasizing on promoting technology, creativity, and innovation. Thus, a new development plan called Thailand 4.0 was born in pushing Thailand into the modern era, The Thailand 4.0 development plan is focused on 10 targeted industries, which can be divided into two segments, The first developing existing industrial sectors by adding value through advanced technologies for five industries are as follows 1) next-generation automotive 2) smart electronics 3) high-income tourism and medical tourism 4) efficient agriculture and biotechnology and 5) food innovation. The government has targeted five additional growth engines to accelerate Thailand's future growth as follows: automation and robotics, aerospace,

bio-energy and bio-chemicals, digital, and medical and healthcare [1].

Thus, the people who uses and understands well technologies will help creating the country's sustainability. Educated peoples is one of the most crucial factors for developed country, so education is important issue for everyone. The 21st century education has change from teacher-centered to active learning, the teachers' roles are changed from lecturer to coacher which are consistent with National Education Act B.E. 2542 (1999) and amendments (Second National Education Act B.E. 2545 (2002) [2], and has specify the requirements that provision of learning education must be based on the principle that all learners are able to learn and develop themselves. Student should be encouraged to develop naturally to their full potential and considered the most important. The need for success in 21st century education is learning skills consisting of life and career skills, learning and innovation skills, information media and technology skills. In educating technology and engineering, active learning is necessary to promote students to have essential skills in industry and education sectors.

The sensor technology is one of the innovations used in automation system, many sensors are used to control various processes in many parts of industry and agriculture for detecting light, sound, temperature, humidity and many others. The sensor technology is an important content because it has be used extensively and applied in the development of the country consistent the Thailand 4.0 plans.

Currently, the sensor technology is developed continuously in supporting industry and day life, so classroom learning cannot provide learners to have fully knowledge and the instructional media is not enough to get the appropriated knowledge, skills and attitude. Thus instructional model development have be a necessary to promoting students to have expected learning outcome. Recent several years, instructional models [3-7] have been

developed such as, problem-based, project-based, and research based and so on. Specifically project-based learning is one of instructional model which believed students to acquire a deeper knowledge through various activities of real-world challenges and problems. Thus, students should have learn using learning by doing or assigning projects. It allows students to work more autonomously to construct their own learning, and culminates in realistic [8].

In this paper, the DAPOA project-based learning model [9] presents how to apply in the teaching of sensor device and its application subject. The objective is to encourage students to have more effectively knowledge skills both theory and practical and higher learning achievement.

II. DAPOA PROJECT-BASED LEARNING MODEL

Project-based learning is a learning model which students gain knowledge and skills by working for an extended period of time to investigate and respond to an authentic, engaging and complex questions, problems, or challenge. Project based working is focused on student learning achievement including essential skills for works. In industrial sectors, technicians or engineers who have good knowledge, skills and attitude will get opportunity to work more. Presently, most learning and teaching in industrial still use the lecture-based and teacher centered, thus the learning achievement of students is below standard and the instructional media don't have enough and cannot support the appropriated learning outcome of students. Therefore, how to teaching methodology that use efficient learning and teaching to promote students in integrating science and technologies to create a prototype instructional media.

Thus, this article presents how to using the DAPOA learning model for teaching in industrial education. The DAPOA model as shown in Figure 1, based on the project-based learning consists of 5 learning processes, as follows:

- 1) Determination process that learners must study and find the problem issues from teachers' assignment or interesting topics.
- 2) Analysis process that learners must search and analyze the best methods to solve the different assigned solutions by brainstorming in small group.
- 3) Planning and Design process that learners must plan and design the operating process and project layout.
- 4) Operation process that learners must learn and practice following determined activity plan.
- 5) Assessment process that the performance of learning and teaching are measured and evaluated.

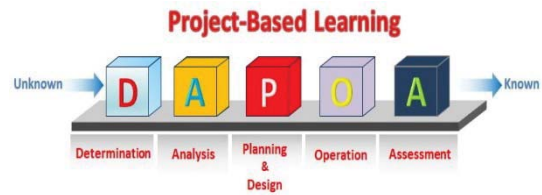


Figure 1 The DAPOA Project-Based Learning Model

In implementing the DAPOA model in the teaching of sensor device and its application subject, the developed learning activities were presented, as shown in Figure 2.

During learning and teaching in the classroom, the learning performance was measured and evaluated by using the various assessment forms including the determining form, analyzing form, planning and designing form and progressing form, as shown in Figure 3.

III. LEARNING AND TEACHING PROCESSES

In this research, we will focus on how to using the DAPOA project-based learning model for sensor device and its applications by assigning the determined project topics to each student group. The learning sequential is as follows,

1) Determination "D" step, teachers will determinate the interesting topics from research papers or various information sources. Students will find and research the problem issues of interesting topics, as shown in Figure 4.

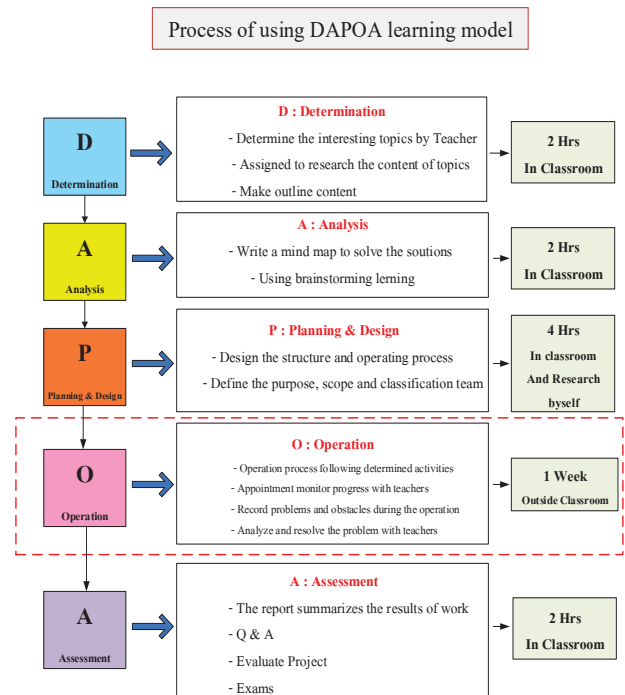


Figure 2. The learning activities of the DAPOA learning model

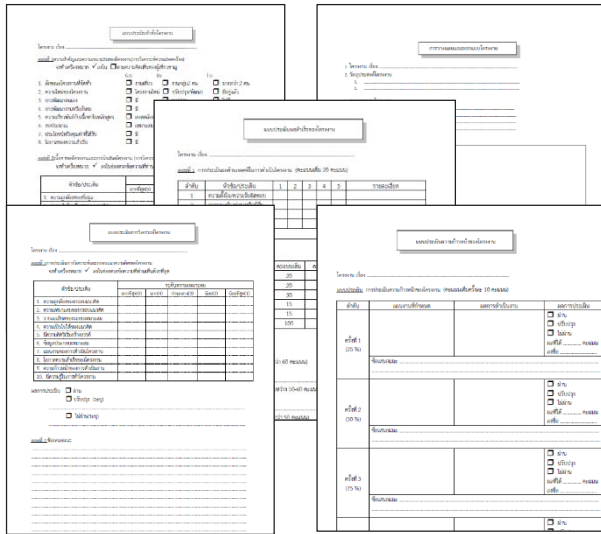


Figure 3. Evaluating form of DAPOA Model



FIGURE 4. DETERMINATION PROCESS

2) Analysis “A” step, students will analyze feasibility to find how best method to solving determined solutions by brainstorming of each student group and teachers will provide consultant in the solving problems in learning, as shown in Figure 5.



Figure 5. Analysis Process

3) Planning and Design “P” step, students will plan and design the operating process using the simulation programs or technology tools, as shown in Figure 6.

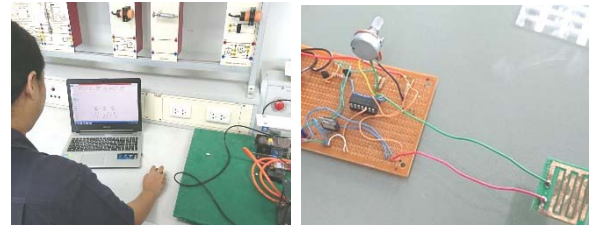


Figure 6. Planning and Design Process

4) Operation “O” step, students will create the project following the determined activity plan. Students will get practical skills by doing project and troubleshooting, as shown in Figure 7.

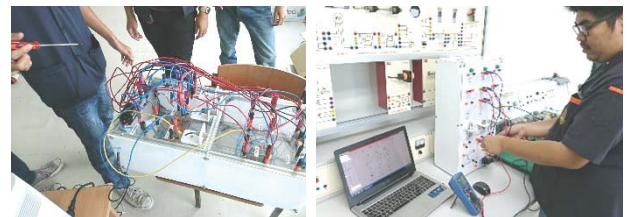


Figure 7. Operation Process

5) Assessment “A” step, after creating assigned project, students must present finding results of the constructed project. Teachers will advise and evaluate the learning achievement of learners, as shown in Figure 8.



Figure 8. Assessment by presented and examination

In the evaluating the learning achievement, students will present the completing project that consists of hardware, software and project’s manual, an example of project was shown in Figure 9. Moreover, students will present and discuss together in classroom to exchange discovering knowledge among teacher and students.

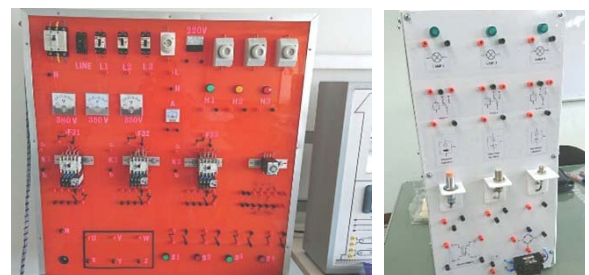


Figure 9. Completing Project using the DAPOA learning model

IV. RESEARCH RESULTS

In implementing the DAPOA project-based learning model in the teaching of the sensor device and its applications using sampling group of 27 bachelor students in electrical technology program in academic years 2/2016, at the Thepsatri Rajabhat University. The performance of the DAPOA project-based learning model was evaluated by analyzing learning achievement, as shown in Table I.

TABLE I Result of efficiency of the DAPOA Project-Based learning model

Test	Students	Full Score	Mean	SD	Meguigans
Pre-Test	27	15	6.81	1.44	1.11
Post-Test	27	15	12.70	0.99	

Table I shown that the efficiency of the DAPOA project-based learning model agreed to the standard criteria of the Meguigans's formula (equaled to 1.11). Moreover, students' satisfaction in learning process using the DAPOA project-based learning model was evaluated using questionnaire of 5 rating scales. The result found that the students' satisfaction was at very high level (mean equaled to 4.54), as shown in Table II.

TABLE II The results of students' satisfaction for DAPOA Project-Based Learning Model

Evaluated topics	\bar{X}	S.D.	Interpret
1. The DAPOA Learning Model	4.72	0.46	Very High
2. Learning Activities	4.52	0.59	Very High
3. Duration of the learning activities	4.28	0.54	High
4. Learning promote collaboration and critical thinking skills	4.32	0.63	High
5. Assessments	4.84	0.37	Very High
Summary	4.54		Very High

TABLE III The evaluation of the efficiency comparison normally class with using the DAPOA Project-Based Learning Model

Instructional Model	Academic years	N	Full score	total	Mean score	E2 (%)
Normally class	2015	26	30	451	17.35	57.82
Using DAPOA Learning model	2016	27	30	576	22.15	73.85

Table III shows that the evaluation of the efficiency comparison between teaching of Sensor and Measurement course using normally class in academic year 2015 and using the DAPOA Project-based learning model in academic year 2016, the results of learning achievement had the average score equaled to 57.82 % and 73.85 % respectively, it can be seen that the DAPOA Project-based learning model can be applied in learning and teaching of the electrical technology course as well and encourage students to have highly leaning achievement.

V. CONCLUSION

The using of the DAPOA project-based learning model for learning and teaching of the sensor device and its applications course have been presented. The DAPOA learning model can be applied efficiently in the teaching of electrical technology and engineering education. The developed DAPOA project-based learning model has several advantages as;

- 1) To be able to promote the theoretical and practical skills.
- 2) To encourage collaborative learning between students and teacher in solving problem of working.
- 3) To encourage students to have more term work skills, communication skills and experience in working.
- 4) To build reasonability, attitude and self-confidence of students.
- 5) To promote lifelong learning.

However, disadvantages of the DAPOA Project-based learning model are as follows;

- 1) The student should have the good basic knowledge and skills, then they will can follow up efficiently the DAPOA learning process.
- 2) If assigned projects are complicate and difficult, learning time period in several DAPOA process will take long time to working and concluding.

As above results, the DAPOA learning model can be used efficiently the learning and teaching to encourage innovation in science and technology through the development of people and/or to product the quality Thai peoples that can create novel innovations supporting the era of Thailand 4.0 and help build sustainable future of the country.

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