

Program Development for Enhancing Competencies of Vocational College Teachers in Mechatronics and Robotics under the Office of the Vocational Education Commission

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Abstract

The purposes of this research were to 1) study the components and indicators of teacher competency in Mechatronics and Robotics, 2) study the current states, desirable states, and the needs for teacher competency development in the Mechatronics and Robotics Department, 3) design and development of teacher competency-enhancing programs in Mechatronics and Robotics, and 4) study the results of implementing the teacher competency-enhancing program in the Mechatronics and Robotics Department. This research was research and development conducted in 4 phases following the research purposes. The results showed that 1) Components and indicators of teacher competency in Mechatronics and Robotics have 5 components and 36 indicators confirmed by experts are appropriate at the highest level. 2) The current state of teacher competency in the Mechatronics and Robotics Department overall is moderate, and desirable condition overall is at the highest level, The competency development methods consist of (1) Self-study (2) Training (3) Workshops (4) Study visits and (5) Practice in the workplace, and the priorities of the needs to develop competencies are (1) Self-development (2) Ethics and professional ethics of teachers (3) Learning measurement and evaluation (4) Curriculum administration, and learning management (5) Building relationships and cooperation with communities for learning management, respectively. 3) Teacher Competency-enhancing Program in the field of Mechatronics and Robotics consists of (1) Principles, (2) Objectives, (3) Models and methods for development, (4) Content and development activities, amounting to 5 modules, and (5) Evaluation. The program evaluation results by qualified experts are appropriateness, utility, and possibility at the highest level. 4) The results of implementing the teacher competency-enhancing program in Mechatronics and Robotics were found as follows: (1) Pre-development knowledge of teachers in Mechatronics and Robotics education showed an average score of 17.30 out of 30 (57.66%), while post-development knowledge increased to an average score of 26.30 out of 30 (87.67%). (2) Overall, teachers' competencies improved from a moderate level to the highest level after program implementation. (3) The satisfaction evaluation of program participants indicated the highest level of satisfaction in overall and each aspect.

Keywords: competency-enhancing program, teacher competency, mechatronics, robotics

1. Introduction

The 20-year national strategy policies (2018-2037) related to manpower production and development and raising the level of production, and quality of labor to increase the country's competitiveness. The development of human potential over the course of a lifetime supports the growth of the country by reforming the building project and education management system in terms of vocational manpower production, it is necessary to change the teaching and learning management by using appropriate technology. Learners have working attitudes, and professional experience in the workplace and must take into account the availability of production resources by emphasizing allowing the business and industry to participate in the management of education in a concrete way. (Bunyasophon, 2012), which is in line with the National Education Act B.E. 2542 and the amendment (2nd edition) in B.E. 2545 has emphasized teaching and learning, allowing students to learn lifelong according to their aptitude and interest by emphasizing learning from real practice according to the potential of the learners. Providing importance to the management of bilateral vocational education both at the vocational certificate level and the higher vocational certificate level (high vocational certificate) is educational management that emphasizes

practice. Providing students the opportunity to study, and learn along with professional training in the workplace or various scientific sources. Students will gain work experience directly from real workplace sources and earn income while studying. This is in line with the 12th National Economic and Social Development Plan which focuses on developing people of all groups and ages to have basic knowledge and life skills to develop performance skills of the labor force in line with the needs of the labor market, ready to step into the world of work and compete with quality. The objective is to develop people and Thai society in order to strengthen the competency of manpower to be able to earn a living and support the competition of the target country qualitatively which is developing people to have the ability to solve problems and have professional skills. The quantitative goal is to increase the quality of the middle-class labor force to at least 60 percent of the country's labor force.

The Independent Education Reform Committee of the Education Council Secretariat convened to consider the matter, problematic condition, and strategy of the Office of the Vocational Education Commission by discussing the problems of production and development of vocational teachers, including ideas to bring to practice and respond to the national strategy. In developing the quality of teaching and learning, focus on building performance, and the important turning point that can cause change is the vocational teacher, so there is a professional standard for vocational education teachers. It is divided into 2 parts: Part 1 Competency in professional knowledge of vocational education teachers consists of 1) Core competencies, which are social competencies by being good role models, morality, ethics, communication skills with digital skills language, analytical thinking 2) competency in duty in professional competency, Integrating the learning process curriculum and managing teaching and learning effectively, and 3) specific competencies expertise in the field, Each field must be able to work in its own field or have relevant experience in that field. Section 2 Professional Experience. Those who are vocational teachers must practice the teaching profession during their studies/as teaching assistants. Teach in educational institutions in specific professional fields and professional practice or teaching in the workplace with a certificate of practical training (The Secretariat of the Education Council, 2017)

The Office of the Vocational Education Commission has cooperated with the private sector, collaborate with the Pracharath Power Steering Committee In terms of enhancing professional quality (E2), the current vocational curriculum has been developed into a competency-based curriculum, In line with the future industry careers, First S-Curve and New S-Curve according to vocational qualification standards at all levels. It is a premium vocational course or a new breed of quality high-level and highly specialized to meet the requirements of entrepreneurs accordingly, therefore assigned to educational institutions that are prepared for teaching and learning under the new occupational production program. The vocational certificate program 2019 was approved in the category of industrial subjects in the field of mechatronics and robotics (Office of the Vocational Education Commission, 2020).

As mentioned above, this presented the importance and the role of mechatronics and robotics. The continuous increase in mechatronics and government support is an important channel and represents the progress and development of mechatronics to accommodate such changes that occur an undeniable cornerstone of the backlash of mechatronics to step into the mechatronics and robotics industry is the labor or operator under this science. It is great news that in Thailand, there are courses in human capital development to support the mechatronics and robotics industries but the field of mechatronics and robotics is a newly developed course, and teachers and teaching personnel do not yet have experience in mechatronics and robotics, received technology training. Mechatronics both inside and outside the school or in establishments both inside and outside the country bring knowledge to transfer to learners to gain full knowledge. In addition, teaching materials in this field require a relatively high budget, so the establishment is the best source of learning and training for teachers but still lacks a teaching and learning model to develop teachers' professional competencies in mechatronics and robotics which is a model suitable for the development of teachers' competencies. In the aforementioned disciplines, the researcher as an administrator therefore interested in studying and researching "Development of Teacher Competency Development Program in Mechatronics and Robotics of Educational Institutions under the Office of the Vocational Education Commission" to be used as a guideline for further development of the quality and to develop the professional competency of teachers in the field of mechatronics and robotics in educational institutes under the Office of the Vocational Education Commission.

2. Research Conceptual Framework

The researcher has determined the theoretical framework used in the research by analyzing and synthesizing the principles, concepts, and theories from scholars, research consisting of:

I. Components of teacher competency in the Mechatronics and Robotics program of educational institutions under the Office of the Vocational Education Commission consists of 5 components as follows: 1) Curriculum administration and learning management 2) Teacher professional ethics and ethics 3) Self-development 4)

Development learners and 5) Establishing relationships and cooperation with communities for learning management (McClelland, 1973; Office of the Basic Education Commission, 2010; Rassameethammachot, 2014; Wangmeejongmee, 2017; Turkish Republic Ministry of National Education, 2006).

II. Methods for teacher competency development in Mechatronics and Robotics of educational institutions under the Office of the Vocational Education Commission, namely 1) Self-study 2) Training 3) Workshop 4) Study visit, and 5) Practice in the workplace (Chiwachart, 2015; Chansirisira, 2011; Thongkam, 2019).

III. Program components consist of 1) Principles, 2) Objectives, 3) Forms and methods for development, 4) Content and development activities, and 5) Program evaluation (Kanaya & McMillan, 2005; Kongsuk, 1997).

IV. The process of program development consists of 1) Analysis to find the goal of program success 2) Planning for program preparation by using information from the analysis process to plan for program creation 3) Creating a program for training purposes 4) Program trial and 5) Program evaluation to use the evaluation results to develop the program (Caffarella, 2002; Sarattana, 2013; Mongkolvanich, 2012).

V. Evaluation of the program consisted of 1) Appropriateness 2) Feasibility, 3) Utility (Songtiang, 2005; Jomhongpipat, 2010; Stufflebeam, Madaus, & Kellaghan, 2000).

The research conceptual framework is shown in Figure 1.

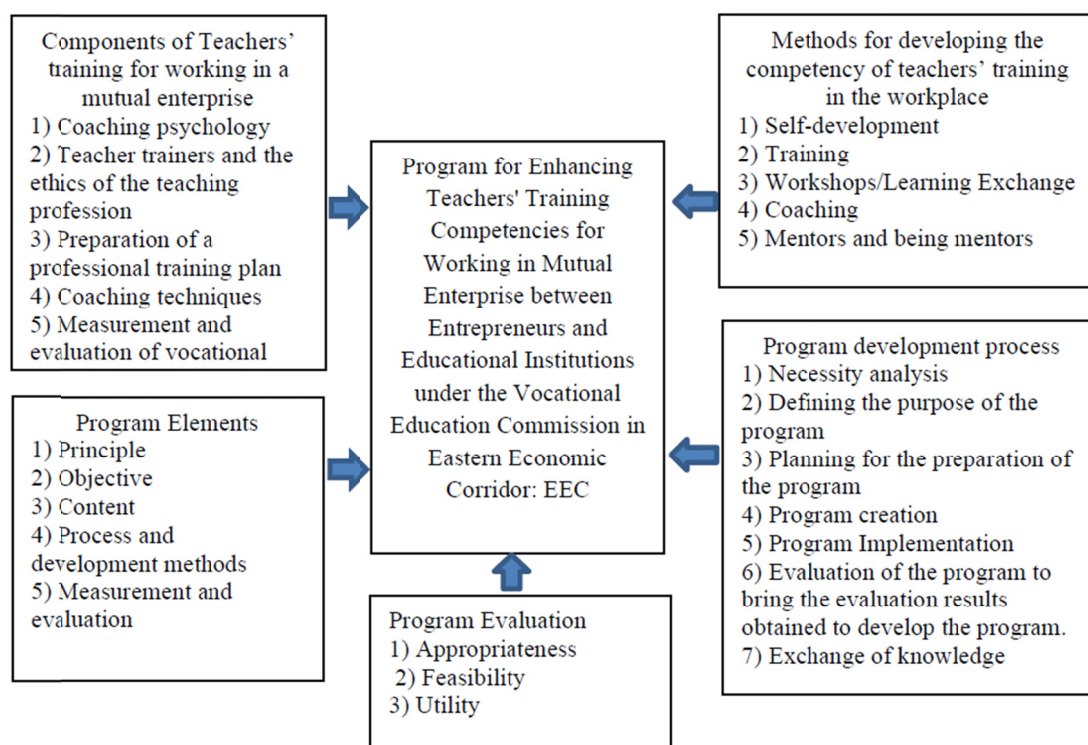


Figure 1. Research conceptual framework

3. Research Objectives

- 1) To study the components and indicators of teacher competency in Mechatronics and Robotics of educational institutions under the Office of the Vocational Education Commission.
- 2) To study current states, desirable states, methods of development, and needs for enhancing the competency of teachers in the field of mechatronics and robotics of educational institutions under the Office of the Vocational Education Commission.
- 3) To design and develop the competency-enhancing program for teachers in the field of mechatronics and robotics of educational institutions under the Office of the Vocational Education Commission.
- 4) To study the results of implementing the competency-enhancing program for teachers in the field of mechatronics and robotics at educational institutions under the Office of the Vocational Education Commission.

4. Research Methodology

This research is research and development. The research procedure was divided into 4 phases as follows:

Phase 1: Study the components and indicators of teacher competency in the Mechatronics and Robotics Department of educational institutions under the Office of the Vocational Education Commission. The group of informants who examined the appropriateness of the components and indicators was 7 experts by purposive sampling. Data were collected using a semi-structured interview form with an IOC value between .80-1.00. Data were analyzed using content analysis, and percentage statistics.

Phase 2: Study current conditions, desirable conditions, methods of development, and needs for enhancing teacher competency in the Mechatronics and Robotics Department of educational institutions under the Office of the Vocational Education Commission.

Population: This includes administrators and teachers from six government-affiliated educational institutions offering mechatronics and robotics courses, totaling 120 individuals.

Sample Group: This includes administrators and teachers from six affiliated educational institutions offering mechatronics and robotics courses, randomly selected using stratified random sampling (Srisa-ard, 2010), totaling 54 individuals.

Data were collected using a current condition and desirable condition 5-level scale questionnaires with an IOC value between .80-1.00, a reliability value for the current condition of .92, and a desirable condition of .96

The statistics used in data analysis were frequency distribution, percentage, mean, standard deviation, and Modified Priority Needs Index (PNI_{modified}).

Phase 3: Design and development of teacher competency-enhancing programs in the Mechatronics and Robotics Department of educational institutes under the Office of the Vocational Education Commission. Informants in a focus group discussion consisting of 8 experts to develop a teacher competency-enhancing program in Mechatronics and Robotics designed to be more complete that is obtained according to the specified criteria, and a group of informants who assess appropriateness, feasibility, and utility of the program namely, 8 experts who have been obtained according to the specified criteria. Data were collected using an assessment form with an IOC value between .80-1.00.

Phase 4: A study of the results of implementing the teacher competency-enhancing programs in the Mechatronics and Robotics Department of educational institutes under the Office of the Vocational Education Commission.

- The sample group that tried the model was teachers of the Mechatronics and Robotics Department at Chaiyaphum Technical College under the Office of the Vocational Education Commission. 10 people were obtained by purposive sampling and voluntarily participated in the development.
- Data were collected using a test of knowledge about competency form, teacher competency assessment form, and the satisfaction questionnaire with an IOC value between .80-1.00.
- The statistics used in data analysis were percentage, mean, and standard deviation.

5. Research Results

The results of the research found as follows:

I. Components and indicators of teacher competency in the Mechatronics and Robotics Department of educational institutions under the Office of the Vocational Education Commission consisted of 5 components and 36 indicators as follows: 1) Curriculum administration and learning management consisted of 8 indicators 2) Ethics and professional ethics of teachers consisted of 8 indicators 3) Self-development consisted of 7 indicators, 4) Learner development consisted of 7 indicators, and 5) building relationships and cooperation with communities for learning management, consisted of 6 indicators, the results of the assessment of the suitability of components and teacher competency indicators was found that the suitability was at the highest level.

II. Results of the study of current states, desirable states, methods of development, and needs for teacher competency development in the Mechatronics and Robotics Department of educational institutions under the Office of the Vocational Education Commission.

The current state of teaching competency in the Mechatronics and Robotics Department of educational institutions under the Office of the Vocational Education Commission is classified by components, The overall level was moderate and when considering the aspects in descending order, these include building relationships and collaborating with communities for learning management, ethics and professional, ethics of teachers, self-development, curriculum administration and learning management and student development, respectively.

The desirable states of teacher competency in the Mechatronics Department and robots of educational institutions under the Office of the Vocational Education Commission classified by overall components at the highest level and when considering the aspects in descending order, namely ethics and professional ethics of teachers, curriculum administration and learning management, self-development, building relationships and collaboration with communities for learning management and student development, respectively.

The methods of teacher competency development in the Mechatronics and Robotics Department of educational institutions under the Office of the Vocational Education Commission by adhering to the development principle 70: 20: 10, which is 10% from program learning, 20% from others, and 70% from experiential learning, using various development methods consisting of 1) Self-study 2) Training 3) Workshop 4) Study visit, and 5) Practice in the workplace

The needs for teacher competency development in the Mechatronics and Robotics Department of educational institutions under the Office of the Vocational Education Commission in order of need in descending order, these included 1) Self-development, 2) Teacher professional ethics and ethics, 3) Learning measurement and evaluation, 4) Curriculum administration and learning management, and 5) Building relationships and cooperation with communities for learning management.

The current state, desirable states, and needs for teacher competency development in the Mechatronics and Robotics Department of educational institutions under the Office of the Vocational Education Commission were shown in Table 1.

Table 1. The current state, and desirable mean, standard deviation, and priority needs of teacher competency in the Mechatronics and Robotics Department of educational institutions under the Office of the Vocational Education Commission, Overall, each aspect

Teacher competency in the Mechatronics and Robotics Department	Current state (D)	Desirable state (I)	PNI _{modified}	Priority needs
1. Curriculum administration and learning management	2.72	4.72	0.735	2
2. Ethics and professional ethics of teachers	2.74	4.74	0.729	3
3. Self-development	2.74	4.70	0.715	4
4. Learner development	2.69	4.68	0.739	1
5. Building relationships and cooperation with communities for learning management	2.77	4.69	0.693	5
Total	2.73	4.70	0.722	

The teacher competency-enhancing program in the Mechatronics and Robotics Department of educational institutions under the Office of the Vocational Education Commission consists of the following: 1) Principles 2) Objectives 3) Models and methods of development 4) Contents and development activities consisting of 5 modules, namely Module 1: Learner Development, Module 2: Curriculum Administration and Learning Management, Module 3: Ethics and Professional Conduct, Module 4: Self-Development, and Module 5: Networking for Learning Using a development period of 140 hours, and 5) Evaluation, which is developed based on the development principle of 70: 20: 10, including learning from the program 10%, learning from others 20% and learning from experience 70% by using a variety of development methods consisted of 1) Self-development 2) Training 3) Workshop 4) Study visit and 5) Practice in the workplace. The development process has been defined in 4 phases, namely, Phase 1: Preparation, Phase 2: Training, Phase 3: Learning from Operations, and Phase 4: Exchange of Knowledge. The results of the program evaluation by 7 experts found that it was appropriate, feasible, and utility at the highest level. The results of the preparation of the manual for the use of the teacher competency-enhancing program in Mechatronics and Robotics consists of 3 parts; Part 1: Introduction, Part 2: Teacher Competency-enhancing Program Mechatronics and Robotics, and Part 3: Implementation of Teacher Competency-enhancing Programs in the Mechatronics and Robotics Department to be used in enhancing teacher competency in Mechatronics and Robotics Department of educational institutes under the Office of the Vocational Education Commission, and the results of the evaluation of the program manual by 7 experts found that the suitability was at the highest level.

The results of implementing the teacher competency-enhancing program in the Mechatronics and Robotics program of educational institutes under the Office of the Vocational Education Commission at Chaiphum Technical College.

- Knowledge test results on teacher competency in Mechatronics and Robotics Department There is a score before development received an average score of 17.30 out of a full score of 30, representing 57.66%, and a score after development. The average score was 26.30 out of 30, representing 87.67 percent, indicating that teachers had higher scores after development than before and teachers in the field of mechatronics and robotics. Everyone passed the 80% criteria.
- The results of teacher competency assessment before development were generally at a moderate level, and after development, overall, it was at the highest level. When considering the aspect, all aspects and items were at the highest level.
- Satisfaction evaluation results of the teacher competency-enhancing program, overall, and in each aspect were at the highest level.

6. Conclusion and Discussion

According to the research on Program Development for Enhancing Competencies of Vocational College Teachers in Mechatronics and Robotics under the Office of the Vocational Education Commission conclusion, there were some interesting issues that can be discussed as follows:

I. Components of teacher competency in the Mechatronics and Robotics Department of Educational institutions under the Office of the Vocational Education Commission confirmed by experts, overall, it was appropriate at the highest level. This is because teachers of mechatronics and robotics should have competencies that cover knowledge, abilities, skills, and desirable characteristics both in the creation and development of the curriculum. The design of learning activities is consistent and systematic by focusing on the students is important. Cultivate morality, ethics, and democracy exchange of knowledge to generate new knowledge both academically and professionally Innovations are created for self-improvement and ongoing work development. Behavior is correct in accordance with the professional ethics of teachers, professional, self-development, professional responsibility, building good relationships, and networking with parent communities, and other organizations, both public and private, to support and promote learning management. Ability to measure and evaluate according to real conditions, planning, designing, creating, and developing tools for measuring and evaluating. These components and indicators of competency were derived from literature reviews from many scholars, including McClelland, (1973), Office of the Basic Education Commission (2010), Rassameethamchot (2014), Wangmeejongmee (2017). Therefore, it is believed that the evaluation results are at the highest level consistent with the research of Jutasong, Sirisuthi, and Phusee-on (2016) on the development of a program to enhance teachers' learning management competencies under the Office of Non-formal Education and Informal Education. It was found that the components and indicators of teacher learning management competency consisted of 6 components and 30 indicators, namely 1) Curriculum creation and development for adult learners, 2) Knowledge based on learning content, and 3) Instructional design learning for adult learners, 4) Organizing a variety of learning processes, 5) Using media and developing innovative media in learning management, and 6) Measurement and evaluation confirmed by experts overall, it was at the highest level.

II. Current states, teacher competency in Mechatronics and Robotics of Educational institutions under the Office of the Vocational Education Commission classified by components, the overall level was moderate. Desirable states for teacher competency in Mechatronics and Robotics of Educational institutions under the Office of the Vocational Education Commission are classified by overall components at the highest level and methods for enhancing teacher competency in Mechatronics and Robotics of Educational institutions under the Office of the Vocational Education Commission according to the opinions of the respondents can be arranged in descending order, namely 1) Self-development 2) Training 3) Workshop 4) Study visit 5) Practice in the workplace and the results of the assessment of the needs for enhancing teacher competency in Mechatronics and Robotics of educational institutions under the Office of the Vocational Education Commission in order of need in descending order, these included 1) self-development, 2) teacher professional ethics and ethics, 3) learning measurement and evaluation, 4) curriculum administration and learning management, and 5) building relationships and cooperation with communities for learning management, This may be due to the current field of mechatronics and robotics. It is a modern course. It is needed by industrial establishments. to support the production and development of mechatronics and robots of modern industry by providing teachers with skills and knowledge in all types of industrial mechanics taught in the aforementioned disciplines in the application of knowledge from various disciplines, there may be problems in laying the foundation for mechatronics and robotics, correct for students which is the teaching and learning quality. Teachers need to develop their skills, knowledge, and professional expertise in mechatronics and robotics effectively consistent with the research in line with the research, Charoentham (2018) studied the development of a science teacher development program in learning management

to promote critical thinking in secondary school students. It was found that the overall current condition was at a high level. The overall desirable condition was at the highest level. The development methods for all 6 components were used as development methods: 1) Self-study, 2) Training, 3) On-the-job training, 4) Mentoring, 5) Teaching, 6) Field trips, 7) supervision, and 8) School-based.

III. Teacher competency-enhancing program in Mechatronics and Robotics of educational institutions under the Office of the Vocational Education Commission consisting of the following: 1) Principles 2) Objectives 3) Models and methods of development 4) Contents and development activities, consisting of 5 modules as follows: Module 1: Learner Development, Module 2: Curriculum Administration and Management Learning, Module 3: Ethics and Professional Conduct, Module 4: Self-Development, Module 5: Networking for Learning Using a development period of 160 hours, there is a method for developing teacher competency in Mechatronics and Robotics of Educational institutions under the Office of the Vocational Education Commission by adhering to the development principle 70: 20: 10, which is 10% from program learning, 20% from others, and 70% from experiential learning, using various development methods consisting of 1) training, 2) Self-development, 3) Workshop meeting, 4) Study visit, and 5) Work practice. The development process has been defined into 4 phases, namely, Phase 1: Preparation, Phase 2: Training, Phase 3: Learning from Operations, and Phase 4: Exchange of Knowledge. Evaluation Results of the program evaluation by experts found to be an appropriate possibility and useful at the highest level and the results of the preparation of the manual for the use of the teacher competency building program in Mechatronics and Robotics of educational institutions under the Office of the Vocational Education Commission consisted of 3 parts: Part 1: Introduction, Part 2: Teacher competency building program Mechatronics and Robotics, and Part 3: Implementation of Teacher Competency Building Programs in Mechatronics and Robotics to be used in enhancing teacher competency Evaluation results of the program manual by experts. It was found that it was appropriate at the highest level. This is due to the development of teacher competency. The field of mechatronics and robotics with the program is a method that can develop the competency of teachers, comprehensive and continuous teachers in the field of mechatronics and robotics play an important role in enhancing knowledge learners' abilities to produce and develop manpower in mechatronics and robotics support in the modern industry which requires self-development through a variety of methods and must adjust the teaching and learning process to keep up with changes, not just a teacher but must be a teacher or facilitator of learning and to develop student's skills, knowledge. Professional competence in mechatronics and robotics in the future, in line with the research of Jutasong, Sirisuthi & Phusee-on (2016) conducted research on the development of a competency enhancement program for teachers under the Office of Non-formal Education and Informal Education, teacher learning management Under the Office of the Promotion of Non-formal Education and Informal Education. The components of the program are 1) The Principles and concepts of the program, 2) The objectives of the program, 3) The development methods, and 4) The structure of the program. The contents of the program consisted of 6 modules as follows: 1) Creating and developing a curriculum for learners who are adults, 2) Body of knowledge based on learning content, 3) Learning design for adult learners, 4) Organization of various learning processes, 5) The use of media and innovative media development in learning management, and 6) Measurement and evaluation took 180 hours. The development methods were 1) training/workshop training 2) field trips 3) teaching 4) self-study 5) mobilization brain and 6) small group meetings. There are 4 stages in the development process; Stage 1: Pre-Development Assessment, Stage 2: Development, Stage 3: Knowledge Integration, and Stage 4: Post-Development Assessment. The results of the evaluation by experts found that it was usefulness, feasibility, suitability, and accuracy are at the highest level.

IV. The results of implementing the teacher competency-enhancing program in the Mechatronics and Robotics of Educational institutions under the Office of the Vocational Education Commission to use the following results: Knowledge test results on teacher competency in the Mechatronics and Robotics of educational institutions under the Office of the Vocational Education Commission. Their score before development received an average score of 17.30 out of a full score of 30, representing 57.66% and having score after development received an average score of 26.30 out of a full score of 30, representing 87.67 percent, indicating that teachers in the field of Mechatronics and Robotics of Educational institutions under the Office of the Vocational Education Commission the scores after the development were higher than before the development and all teachers passed the criteria of 80 percent. Mechatronics and Robotics of Educational Institutions under the Office of the Vocational Education Commission by assessment before development, the overall level was moderate, and after development, the overall level was at the highest level, and the satisfaction assessment results of the teacher competency building program in the Mechatronics and Robotics of Educational Institutions under the Office of the Vocational Education Commission Overall, it was at the highest level. This may be because teachers of Mechatronics and Robotics learned from the learning module which is an interesting format; there are a variety of learning activities and development methods. It stirred up interest very well. In addition, teachers in Mechatronics and Robotics have undertaken activities as

assigned based on theoretical concepts and principles to create module lessons which consistent with the research of Pannuek (2011) has conducted research on the research and development of the basic education school administrator competency development program and found that 1) the basic education school administrator competency development program consisted of 4 parts: Part 1: Leadership, Part 2: Details of the basic education school administrator competency development program, Part 3 Evaluation tools for basic educational institution administrator competency development programs in the field, and Part 4 Guidelines, conditions, indicators for success in implementing the basic education institution administrator competency development program 2) Educational institution administrator competency development program Effectiveness of the basic education can be seen from 1) the experimental group reacted to the basic education school administrator competency development program. Overall, and all aspects were at a high level which gained the knowledge and skills following the competency of administrators of basic education institutions, new knowledge, and skills are put into practice. 3) After the development, according to the competency development program, the basic education institution administrators in the experimental group gained knowledge and skills according to the administrative competencies of the basic education school administrators' competencies. The performance from the performance of duties was significantly higher than the control group at the .01 level.

For the above reasons, as a result, the researcher developed a teacher competency-enhancing program in the Mechatronics and Robotics of Educational institutions under the Office of the Vocational Education Commission to have awareness of the value and that such development program is useful, appropriate, and feasible, and validity can be used in real situations.

7. Suggestion

7.1 Suggestions for Use

- 1) Administrators and teachers who will implement this program should recognize and value the development of teacher competency-enhancing programs in Mechatronics and Robotics due to the development of the program will have a continuous and systematic nature pass on the development of teacher competency in the Mechatronics and Robotics disciplines continue to be effective.
- 2) Office of the Vocational Education Commission by school administrators should promote and support with knowledge and ability or have specific expertise in line with the content in the program to pass on knowledge to teachers in the Mechatronics and Robotics under development to gain knowledge, understanding, and be able to apply in teaching work effectively.
- 3) Teacher competency assessment results should be used. Department of Mechatronics and Robotics to be used as a score to evaluate the performance of teachers in the Mechatronics and Robotics in order to reinforce self-development and praise and honor in the next opportunity.

7.2 Suggestions for Further Research

- 1) There should be component analysis research to confirm the competency of teachers in Mechatronics and Robotics to develop teacher competency in Mechatronics and Robotics for maximum efficiency and effectiveness.
- 2) There should be follow-up research or further education in terms of applying the program to enhance other competencies of teachers in the field of mechatronics and robotics to have cooperation in teaching and learning management.
- 3) Teacher competency-enhancing programs should be implemented in the Mechatronics and Robotics obtained from this research to be used in the development of educational units in other regions to guide research and development in the field of knowledge in other professional modern technologies.
- 4) There should be qualitative research about implementing teacher competency programs in Mechatronics and Robotics to take action seriously and continuously.

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Authors contributions

Mr. Prasit Thongrasamee and Assistant Professor Dr. Chaoyuth Sirisuthi were responsible for the study design and revising, Mr. Prasit Thongrasamee was responsible for data collection, and data analysis, Assistant Professor Dr. Chaoyuth Sirisuthi drafted the manuscript and Dr. Pha Agsonsua revised it, All authors read and approved the final manuscript, and Professor Dr. Chaoyuth Sirisuthi was responsible for the publication and corresponding manuscript.

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The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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