

MINISTRY OF EDUCATION AND TRAINING  
THE VIETNAM INSTITUTE OF EDUCATIONAL SCIENCES

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**LE THI THO**

**FOSTERING RESEARCH CAPACITY IN  
SCIENCE - TECHNOLOGY OF VOCATIONAL  
COLLEGE LECTURERS IN THE MEKONG DELTA**

**Major: Theory and Education History  
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**AN ABSTRACT OF DOCTORAL DISSERTATION IN  
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## INTRODUCTION

### 1. Rationale

According to the strategic orientation of our country from now to 2020, the vision of 2030, Vietnam basically becomes a modern industrialized country and international integration. One of the most important mission is training high-quality human resources to meet the requirements of the labor market. The Eleventh Congress Party presents the development orientation of education and training in the period of transition: "The development of education and training together with the development of science and technology is the priority national policy"

The development strategy of vocational training for the period 2011-2020: "Developing vocational training is the whole society's career and responsibility" in which specific goals provided are: in 2015, the percentage of labors being through vocational training will reach 40 % (equivalent to 23.5 million people) and 55 % by 2020 (equivalent to 34.4 million people). Regarding Vocational College's Teaching Staff, there are 13,000 teachers in 2015; in 2020 the number will be at 28,000 teachers. The development of teaching staff and managers has been mentioned in the solutions of this strategy: Standardizing vocational teachers and also referring to scientific researches through "*training and improving teachers as well as vocational teaching managers; scientific research about vocational training*".

The mission of teaching and doing scientific research are two primary tasks of teachers at universities and colleges. Vocational teachers had been clearly stated through Circular No. **09 /2008/TT-BLĐTBXH** about "*the working regime guidance for Vocational teachers*", in which their activities in scientific research are: "*studying, fostering qualifications, scientific research: 12 weeks for vocational college teachers; 8 weeks for vocational teachers*".

The training and fostering for vocational teachers is very essential to create teaching staff which ensures both quantity and quality. Fostering pedagogical vocational training is more emphasized, however, fostering scientific research has not received adequate attention yet. Research activities at vocational college maintain lots of shortcomings; the research topics have not formed a complete system on a theoretical background into practice and have no specific assessment processes for the research activities; Vocational teachers's research capacity is still weak.

Deriving from these above reasons, the author decided to conduct the thesis named: "Fostering Research Capacity in Science – Technology for Vocational College Teachers in the Mekong Delta".

### 2. Purposes of study

Developing training processes in order to improve the capacity and quality of research in Science - Technology activities for vocational college teachers in the Mekong Delta, contributing to improve training efficiency of Vocational Colleges in the current period in this area.

### 3. Subjects, objects of the study

**3.1 Objects of the study:** Activities about Research in Science - Technology

**3.2 Subjects of the study:** The process of fostering research capacity in science - technology for vocational college teachers in the Mekong Delta.

**4. Scientific hypothesis:** research activities in science - technology and RCIST of VT still have many obstacles: in finding ideas and research issues; in making scientific theses and identifying knowledge, foundation, professional skills to apply to the process of implementing the study. Most vocational teachers lack of knowledge and

skills in designing survey tool-kits and processing data based on modern information technology softwares; especially, they found difficulties in reporting results of their researches. **If *there are*** fostering RCIST programs for vocational teachers according to capacity-oriented approach, in which the training content are challenging and encouraging vocational teachers participants being actively thinking, creativity, flexibility, and gaining knowledge and skills in scientific research, based on their own experiences and professional experiences, ***it will*** help to improve RCIST of vocational college teachers the in Mekong, as well as contribute to improve the teaching quality of vocational college teachers in Mekong Delta.

### **5. Assignments of the Study**

- Studying theoretical background about fostering RCIST for vocational teachers.
- Analysing and assessing the reality of fostering RCIST for vocational college teachers in the Mekong Delta
- Building the process of fostering RCIST for vocational college teachers in the Mekong Delta
- Organizing experiments on 02 modules in the contents of fostering, evaluating the effectiveness and feasibility of this process.

### **6. The Scope of the study**

The scope of the dissertation is defined as follows:

- Limited in the contents of research: The thesis focuses on the research of fostering RCIST process of some technical majors (Electricity, Electronics, Informatics, Mechanics, Automotive Technology) for vocational college teachers in the Mekong Delta. The contents of fostering process in this study follow capacity approach.

- Limited in the objects to convey and investigate

280 teachers and 07 school managers of 07 Vocational College (VC) in Mekong Delta: Can Tho VC, Soc Trang VC, An Giang VC, Tien Giang VC, Long An VC, Kien Giang VC and Dong Thap VC; interviewing and chatting with 07 managers and experts from 03 Departments of Science and Technology (Can Tho, Soc Trang, Kien Giang).

- Limited in the locality of the research: surveying and investigating 07 Vocational Colleges of 13 provinces in the Mekong Delta.

- Limited on experimenting organizations: the dissertation will hold 02 modules in the content of the fostering RCIST for teachers in Can Tho Vocational College

### **7. Research Methods and Approaches**

**7.1 Approaches:** Following systematic and structural approach, practical approach, objectives approach, capacity approach.

**7.2 Research Methods (RM):** Theoretical RM, Empirical RM, Mathematical Statistic RM of and Experimental RM.

### **8. The basic theses to be protected**

- Research in science - technology is a process of exploration, discovery and creativity of individuals or groups. For professional activities of teachers in general, particularly in vocational teachers, scientific and technological research activities is one of the most important factor which helps individuals develop their ability about professional knowledge, especially in scientific and technological ability in vocational training.

- Enhancing research in science - technology for vocational teachers in vocational colleges is enhancing technical thinking ability, technical innovation

ability and other abilities (such as the ability to detect problems; ability to apply information technology into research; ability to search and select information, etc.

- Improving research in science - technology for vocational teachers needs relying on operating model of vocational teachers, reflecting the structure and function of all components in professional activities of vocational teachers in general, particularly of vocational college teachers in the Mekong Delta .

## **9. New contributions of the thesis**

### ***9.1 In terms of argument***

The thesis has identified the scientific background of fostering RCIST for vocational college teachers. This is a quite closely theoretical framework with the concepts, scientific standpoints, the operating model of vocational college teachers, capacity framework identification, the elements of the fostering RCIST process for vocational college teachers.

### ***9.2 In practice***

The thesis outlines the overall picture of RCIST and fostering scientific and technological research for vocational college teachers in the Mekong Delta. It clarifies achieved and unachieved aspects, the weaknesses, the difficulties of vocational college teachers when they take part in Scientific and technological research activities. In addition, it also reflects inadequate problems in fostering research capacity in science – technology for vocational college teachers in Mekong Delta.

Identifying some of the main reasons of this problem such as: the process of fostering research capacity in science – technology for vocational college teachers in Mekong Delta is still inappropriate. They have not been trained or inadequate trained; they have not promoted ability about scientific technological research.

Organizing and giving the process of fostering research capacity in science – technology for vocational college teachers in the Mekong Delta, contributing to improve the quality of the vocational college teachers.

## **10. The structure of the dissertation**

### **Introduction**

**Content:** including 3 chapters

CHAPTER 1: Rationale of Fostering Research Capacity in Science - Technology for Vocational College Teachers

CHAPTER 2: The Practical Base of Fostering Research Capacity in Science - Technology for Vocational College Teachers in the Mekong Delta

CHAPTER 3: The procedure for training ability to conduct scientific and technological research for teachers in vocational colleges in Mekong Delta

### **CHAPTER 1**

#### **RATIONALE OF FOSTERING RESEARCH CAPACITY IN SCIENCE - TECHNOLOGY FOR VOCATIONAL COLLEGE TEACHERS**

##### **1.1 An overview of the research problem**

###### ***1.1.1 The studies on research capacity in science - technology***

The thesis refers to researches in-country and overseas about research capacity in science – technology

###### ***1.1.2 The studies of research activities on science - technology and fostering research capacity for vocational college teachers***

The thesis refers to research works in-country and overseas about scientific technological research and fostering research capacity in science - technology for vocational college teachers.

## **1.2 The basic concepts**

### ***1.2.1 Research Capacity in Science - Technology for Vocational College Teachers***

*Capacity*: to be understood as the knowledge, skills and attitudes which are necessary for a person to carry out activities which have certain results and objectives determined.

*Research in Science - Technology of Vocational College Teachers* is the study of applied researches and developing on design topics, machinery improvements, equipments, tools and technology ..., building curriculums (in this thesis, the study of curriculum is the curriculum for technical majors mentioned in the limited range of topics, including these industries: Electricity, Electronics, Automotive technology, Mechanical Engineering, Informatics) and vocational teaching methods (especially the integrated teaching methods and teaching practice) ... in vocational training and in manufacture.

*Research Capacity in Science - Technology for vocational college teachers* is the knowledge, skills and attitudes of the abilities of research subjects to work in an effective way scientific technological research activities, which are about applied research topics and the deployment researches includes: research on the application of the achievements of science, technical and technology of machinery and equipment, manufacture processes, information technology, construction of curriculum for technical majors (Electricity, Electronics, Automotive technology, Mechanical Engineering, Informatics) and vocational teaching methods (especially the integrated teaching methods and teaching practice)... into vocational training; research on designing and improving machinery, equipments, instruments ... in manufacture of vocational college teachers.

### ***1.2.2 Fostering Research Capacity in Science - Technology for Vocational College Teachers***

*Fostering (or improving)*: is the process of adding knowledge, skills and attitudes in order to raise the level in a certain field of work. Fostering is to enhance some factors so that people can work better, do better in their field of work. Given the rapid development of science and technology, scientific knowledge has been increasing significantly. The initial qualification of training has been unable to meet the required level, so it requires additional time to foster knowledge and skills to meet the demands of jobs.

*Fostering Research Capacity in Science - Technology for Vocational College Teachers* is the organizational learning activities aimed at fostering additional knowledge, skills and attitudes required for research capacity in science - technology (mainly focus on fostering primary competencies) to enhance research capacity in science - technology of vocational college teachers, which helps individuals finish well their assignments in research in science - technology activities and transfer results of research in science - technology into practice, to meet the requirements of production, sales and services in the manufacture and in vocational training.

## **1.3 Professional activities, research in science - technology and research capacity in science- technology of vocational college teachers**

*Vocational training characteristics*: Associated with the production process in the enterprise: the basic characteristics of vocational training is teaching- learning activities being associated with the production process. If we want to know the content of professional activities, we need to see directly the manufacturing process or see its model at least (studying equipment). Thus, the working contents of the workers as well

as the content and methods of vocational training firstly depend on the scientific - technological base in production and change with their development. Associated with teaching practice in production: vocational training must reproduce social labor, creating new labor which are more skilful and more efficient to replace previous labor lost by developing general capabilities and specific ones of humans.

*Professional activities of vocational teachers (VT) and vocational college teachers (VCT)*

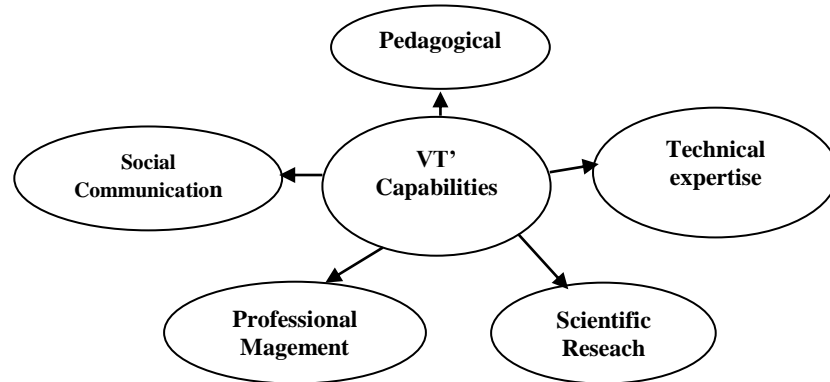


Figure 1.1 Model of Vocational teachers' capabilities

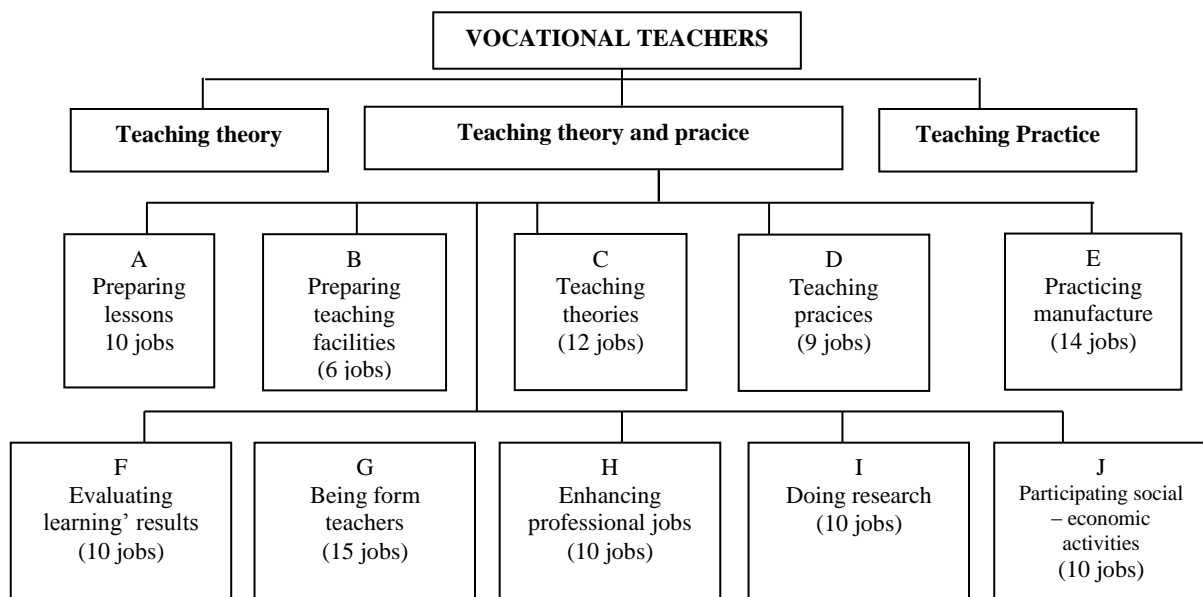


Figure 1.2 Models of vocational teachers' activities

According to this model, the missions of research in science - technology and vocational teachers includes: 1. Proposing research project; 2. Writing a research proposal; 3. Doing a research plan; 4. Organizing research; 5. Surveying; 6. Processing the information; 7. Writing results; 8. Organizing scientific workshops according to topics; 9. Settlement of funds; 10. Protecting the subject acceptance.

Based on the characteristics of vocational training, models of capabilities and activities of vocational teachers analyzed above, the dissertation gives scientific technological research assignments of vocational college teachers as follows: 1. Forming ideas for research and identify the subject of research in science - technology; 2. Planning for scientific technological research; 3. Making funding estimates to conduct research in science - technology's subject; 4. Writing proposal; 5. Writing and completing disclosures of scientific technological research topic; 6. Preparing and

signing a contract to implement the scientific technological research project; 7. Surveying; 8. Processing Information; 9. Designing / improving the products; 10. Organizing experimenting; 11. Writing the results of scientific technological research; 12. Organizing scientific conferences by topics; 13. Protecting scientific technological research topic acceptance; 14. Funding settlement.

- *Research activities in Science -Technology of vocational college teachers:* carried the characteristic of applied research; develop related science, and technology to teaching activities in vocational college; scientific technological research meets the requirements of vocational training in manufacture, sales and service; flexible in mode of study.

*The contents of scientific technological research in vocational training of vocational college teachers:* improving objectives, curriculum content and teaching materials compiled for technical majors at different levels (elementary occupations, vocational, vocational colleges) in vocational training; applying active teaching methods to vocational training; designing, manufacturing or improving supplies, vehicles and equipment for vocational training; studying the relationship between vocational training with manufacturing factories, sales and service in scientific technological research.

The requirements set for scientific technological research activities of vocational college teachers are: need to study more deeply about solutions for specific problems in high science, technique and technology, link to practical manufacture and the practical working process of workers passing vocational training; need to organize scientific technological research activities in vocational college in the trend of cooperating among vocational schools, universities, research institutions to reduce the cost of research. the subjects are required innovations to meet the requirement of professional and specialize development. Ensure requirements about quality of research: input quality; quality of research's deployment process; Output quality; Quality of the application (or external efficiency).

*Criteria for evaluating scientific technological research of vocational college teachers:* due to the limit of time and the scope of the study, this dissertation focused mainly on building the assessment tools for a number of core competencies (selected for testing in chapter 3): the ability to detect problems in research (ability components: detect research problems; form idea; analyse the necessary requirements of research ideas; identify areas and the research ideas; ability to select and use research methods.

#### **1.4 Systems of Research Capabilities in Science - Technology for Vocational College Teachers**

*Research capacity in science – technological framework:* **General Capacity:** The capacity of technical creative thinking, critical thinking capabilities; technical thinking creative capacity; Critical thinking capabilities; Logical thinking capacity; Communicative and cooperative Capacity, teamwork capacity; capacity of negotiating and presenting in scientific technological research. **Specialized capabilities in research capabilities in science - technology;** Capacity of detecting scientific – technological research problems; Capacity to select and use scientific – technological research methods; Capacity of building scientific – technological research proposal; Capacity of analysing and selecting resources for scientific – technological research; Capacity in designing/improving scientific – technological research's products; capacity to design toolkit for investigating, surveying and processing data; Capacity to organize experiments and tests; capacity to write the final report of scientific – technological



research's subject; Capacity to develop scientific – technological research's results; Capacity to estimate budget and settlement for research.

The requirements of research capabilities in science - technology of vocational college teachers: Theories must be incorporated with practices, subject of must be independent to must perform critical tasks, selectively inherit the achievements for topic of research capabilities in science - technology. Research needs to have plan, focus, combination between immediate issues and long term issues. Criteria for evaluating the research capabilities in science - technology of vocational college teachers: due to time limit and the scope of the study, thesis focused on building the assessment tools for a number of core capabilities (selected for experimenting in Chapter 3). 1) Capacity to detect problems in research capabilities in science - technology ( its components include: Detecting research issue; Forming ideas for research; analysing necessary requirements for research's ideas; Identifying areas and ideas for research; 2) Capacity to select and use methods for research capabilities in science - technology (its components include: Forming ideas to combine research method and contents for research capabilities in science - technology's problem solving; Selecting research method; Analysing and applying research methods into solving problems in research capabilities in science - technology; 3) Capacity to build research proposal including naming the dissertation, writing rationale, identifying research's goals and objectives; identifying subjects and objects of the study; analysing and writing hypotheses; determining the scope of the study; delimiting the scope of the research; analysing and selecting approach viewpoints; writing a detailed outline; 4) Capacity to design investigation toolkit, survey and process data (capacity components include: identifying locations for sampling survey; determining of the number of samples need to examine, investigate; identifying the necessary data; the number of questions and the kinds of questions need to investigate, survey; designing questionnaire, survey; determining processing method of the survey data; analysing the data.

This thesis can determine the levels of scientific-technological research for vocational college teachers as follows:

- Capacity is assessed 'good': the capabilities meet completely and exactly, according to the criteria, the manifestations and expression which are proved to be satisfied.
- Capacity is assessed 'quite good': the capabilities meet completely and exactly, according to the criteria, the manifestations and expression which are proved to be satisfied equal or above  $\frac{2}{3}$ .
- Capacity is assessed 'average': the capabilities meet completely and exactly, according to the criteria, the manifestations and expression which are proved to be satisfied equal or above  $\frac{1}{2}$ .
- Capacity is assessed 'poor': the capabilities meet completely and exactly, according to the criteria, the manifestations and expression which are proved to be satisfied less than  $\frac{1}{2}$ .

### **1.5 Approaches for fostering research capacity for vocational college teachers**

Competency Based Training (CBT) and CDIO (Conceive-Design-Implement-Operate) is the training approach under the appropriate capacity to implement the fostering research capability in science- technology for vocational college teachers with the following reasons: both approaches are directed to the standard of training output capacity; based on job analysis to determine the objectives, programs and curriculum; philosophy and orientation of the CBT and CDIO tend to market needs, especially the philosophy of two training types are consistent with the technical

sectors, so it is very suitable to build the scientific-technological research capability of vocational college teachers; Teaching and learning methods according to CBT and CDIO use positive learners methods and based on experiences, the forte of each individual learner to reach the learning objectives; results of both approaches are assessed based on capacity and output standards.

### **1.6 The process of fostering research capacity in Science - Technology for Vocational College Teachers**

The process of fostering research capacity in Science - Technology for Vocational College Teachers including these following contents: The Demand of fostering scientific-technological research capability; Goals and Objectives of scientific-technological research capacity; the Content of fostering scientific-technological research capacity; Views, methods and means of fostering scientific-technological research capacity; the implementation of scientific-technological research capacity; Testing and evaluating the results of improving research capa.

### **1.7 Factors affecting fostering research capacity in science - technology for vocational college teachers**

The objective factors: The policies of activities in research capacity in science – technology activities and improving scientific-technological research capacity for vocational college teachers; The learning and working environmental conditions; facilities.

The subjective factors: motivation; Interest; ability

### **Conclusion of Chapter 1**

1. Fostering scientific-technological research capacity for teachers from vocational college is necessary and important in the period of fundamental and completely reform Vietnamese education nowadays. This is a new issue containing many unsolvable problems, therefore there is not many researches about this issue.

2. The rapid development of science and technology has much impact on vocational training. To meet the training needs of the high quality workforce, it requires vocational training to ensure outcomes training quality. In particular, the vocational teachers play the main role in decisions for the quality of vocational training and meet the requirements of the labor market, manufactures, sales and service.

3. To help vocational teachers in general and vocational college teachers in particular, have enough teaching abilities, we need to train, improve necessary capabilities of VOCATIONAL TEACHERS, in which fostering scientific-technological research capacity can improve research capabilities and teaching ability for vocational college.

4. Fostering scientific-technological research capacity for vocational college teachers is a independent development path which has aims, content, programs and specific criteria evaluation for the research ability development of individual. At the same time, the object in this policy are experienced people who have knowledge in the field of their professional expertise; therefore, the development in the content of solutions should be noted to implement certain fostering process, ensure that it is consistent with the object and quality training; ensure the process of fostering scientific-technological research capacity for vocational college teachers, develop the advantages and bring efficiency to the entire process; enhance scientific-technological research capacity for vocational college teachers.

5. The process of fostering scientific-technological research capacity of vocational college teachers is affected by many factors. This is one of the most important problem

when proposing solutions for the process of fostering scientific-technological research capacity of vocational college teachers. It is necessary to consider the degree of its influences on scientific-technological research capacity of vocational college teachers, which aims to obtain the effectiveness of the fostering process.

## **CHAPTER 2**

### **THE PRACTICAL BASE OF FOSTERING RESEARCH CAPACITY IN SCIENCE - TECHNOLOGY FOR VOCATIONAL COLLEGE TEACHERS IN THE MEKONG DELTA**

#### **2.1 Characteristics of Vocational College Teachers in the Mekong Delta**

-An overview of the Mekong Delta vocational training: The Mekong Delta has an area of 40,576.6 km<sup>2</sup> and has a population of 17.512.900. Vocational training network in the Mekong Delta to the date of 31.10.2014 has 181 vocational training schools (increasing 05 vocational training institutions, equivalent to 2.85% compared to 2013). Including: 13 Vocational college (up 01 school compared to 2013), and 39 Vocational School, 129 Vocational training Centers (up 04 centers compared to 2013). 02 provinces (Tra Vinh and Ca Mau) still have no Vocational College.

- Characteristic of vocational college teachers in the mekong delta: the training sources in the Mekong Delta are various. In which, the percentage of vocational college who are educated from professional universities and colleges is very high. Therefore, their research capacity in science - technology are still limited due to the lack of knowledge, skills about research in science - technology in vocational training. In addition, a number of qualified vocational teachers are retained in vocational school to teach. Hence, they could not have enough knowledge and skills in scientific research, especially in research capacity in science - technology. They meet lots of difficulties in doing research. This shows a need to foster scientific-technological research for vocational college teachers in the Mekong Delta.

#### **2.2 Organizing surveys and investigations**

- *Purposes of the survey and investigation:* aims to collect data to assess the reality of scientific technological research activities, the fostering of research capacity in science - technology for vocational college teachers in the Mekong Delta objectively.

- *The contents of the survey and investigation:* specific content such as: the reality of RCIST activities in some vocational college in the Mekong Delta; The reality of subjective and objective reasons and the difficulties of vocational college teachers when joining in research capacity in science - technology activities; The reality of the fostering research capacity in science - technology for vocational college teachers in the Mekong Delta.

- *The subjects and areas for survey and investigation:* the first target group is vocational college teachers and the second one is school managers. The process of surveying and investigating is conducted by 280 teachers and 07 school managers of 07 Vocational College (VC) in Mekong Delta: Can Tho VC, Soc Trang VC, An Giang VC, Tien Giang VC, Long An VC, Kien Giang VC and Dong Thap VC; interviewing and chatting with 07 managers and experts from 03 Departments of Science and Technology (Can Tho, Soc Trang, Kien Giang).

#### **2.3 The reality about research activities in science- technology and research capability of vocational college teachers in the Mekong Delta**

*The reality about scientific technological research activities of vocational college teachers in the Mekong Delta*

- *The number of theses in the field of scientific technological research activities in the Mekong Delta in recent years:* The number of scientific research projects of vocational college teachers in the Mekong Delta is not much (about 40.7%), the number of articles published is only 8,6%, the number of essays is only at 5.0%.

- *The quality of research capacity in science -technology activities in vocational colleges:* is still weak (about 40.0%), reaching the level of average (30.0%). Overall, the quality of research capacity in science -technology activities of teachers of Vocational colleges in the Mekong Delta is limited in some research areas; has not applied research findings into practice.

- *The attitude of vocational college teachers in research in science -technology a activities:* According to the evaluations of school managers in Vocational Colleges toward the attitude of vocational college teachers in the Mekong Delta when they take part in doing research, their normal attitude (occupied 37.1%). There are some vocational college teachers being very fond research in science -technology activities, they believe that after their research, they would raise their own professional knowledge, promote creative thinking ability, brains rational analysis, logical, sensible, wiser in their work and have got thinking about generalizing problems. Therefore, they are very positive (7.1%), enthusiastic (21.4%)

- *The topics registration for research in science -technology of teachers in vocational college in the Mekong Delta:* the majority of registration is at the time their school organizes such activities (88.6%), a number of registration was done by individuals is the one at provincial / city level or higher.

*Vocational College Teachers participating in doing research in science – technology*

- *The number of vocational college teachers in Mekong Delta has and has not participated in doing research in science -technology a:* 107 teachers have participated (accounting for 38.2%) and 173 teachers have not participated (accounting for 61.8%).

- *Reasons for participating:* vocational college teachers participate in research in science -technology mainly due to some competitions such as finding good teachers, homemade vocational device exam, .. and also to build a short-term training program ... (49.5%). Improving qualifications and professional is also a reason that vocational college teachers take part in doing research (34.6%). A few teachers wanted to undertake works to enhance their professional, develop better their teaching for their own (8.4%). Professional works, the departments if being required some demands about research, they also deliver them to their staff, this number does not account for much (7.5 %).

- *The field of implementation:* research about equipment, teaching aids (accounting for 61.7%). Application of information technology has also attracted attention (20.6%). Curriculums construction (9.3%). Application of new teaching methods in vocational training (5.6%), the nexus between schools and manufactories (approximately 2.8%).

- *Knowledge and skills in scientific technological research of vocational college teachers are equipped from the Master training program* (30.8%). The school organizes to train and foster scientific technological research (22,4%).

- *Difficulties in doing research:* The biggest difficulty is outlining research proposal (57.9%); some other like determining the correct subjects (46.7%); choosing and using effectively research methods (42.1% and 20.6%).

*The number of teachers have not participated in doing research: 173 teachers*

### Reasons:

- Subjective reasons: vocational college teachers has not mastered research method and the content of scientific technological research (56.1%) - this is the most subjective reasons. They themselves are not confident and do not know where to start, how and when to start doing a research. They lack of specialized resources (11.6%). Some teachers consider that they do not benefit from scientific technological research anything for their teaching process.

- Objective reasons: the biggest reason is that the school has not held the fostering of research capacity in science - technology for vocational college teachers (38.2%) due to the school's budget is still limited, the balance expenditure for training activities have more difficulties; facilities for scientific technological research is not equipped enough for vocational college teachers to perform their study (19.1%), the remuneration policy, the policy in the field of scientific technological research are inappropriate (17.9%), the ways to convert working hours into money or awards from research activities of vocational college teachers are still unsolved problems for the vocational colleges. Sources of funding for scientific research activities are not high (9.2%), which limit the scientifically research activities for vocational college teachers.

- The number of teachers will participate in scientific research activities in the coming period: Most teachers answer 'Yes' (154 teachers, approximately 89.3% of the total number of teachers who has not participated in doing research yet); about 19 teachers (10.7%) answer 'No' for doing research with the reason about ages. They are coming to retirement age, so they found that doing scientific and technological research activities is not necessary (almost female teachers).

### *Assessment of Scientific and Technological Research Capacity of Vocational College Teachers in the Mekong Delta*

- Self-assessment of vocational college teachers in terms of research capacity in science – technology and its activities: assessing themselves as 'good' occupied the highest proportion (15%); 'quite good' levels are in which the capacity to determine research' objectives are rated at the highest level (23.4%). The 'average' degree are in which the capacity of collecting, processing, and analyzing data is at a high level (47.7%). 'weak and poor' levels concentrated in providing theses, research hypotheses (51.4%); selecting topics and naming research (30.8%).

- Vocational College managers assess the research capacity in science and technology of vocational teachers: According to the managers, the ability of setting research toolkits appropriately and writing report of results of vocational teachers is the best (11, 4%); The ability to collect and process documentation; set research toolkits fit the topic; Ability to select the appropriate sample with actual situation is quite high (25.7%). 'average and weak' fall on skills of detecting research issues; identifying correct research subjects, funding estimates and proposing technology transfer (31.4%) was the highest rate in weak; the average levels are in determining true objects of the study (47.1%).

- Assessing capacity of doing scientific and technological research is shown through research areas: The results of summarized opinions showed that the ability to conduct research topics which belongs to compiling teaching materials (54.3%), creating and improving teaching facilities (58.6%) are the two areas vocational college teachers performs best. The topics in the fields associating with the manufactories

(according to specific teaching majors) (71.4%); the application of scientific and technological achievements into practice is assessed as weak (44.3%)

#### 2.4 The actual situation of fostering vocational college teachers' capacity in technological and scientific research in the Mekong delta.

*The training needs:* The urgent necessity of technological and scientific research for the time ahead: The ideas of 280 vocational college teachers and 70 managerial personnel agree that it is very necessary to foster the capacity in technological and scientific research for teachers at vocational colleges in the Mekong delta (vocational college teachers: 93,6 % and managerial personnel: 81,4 %)

Table 2.1 the ideas of vocational college teachers and managerial personnel on the urgent necessity of fostering the capacity in technological and scientific research for teachers at vocational colleges in the Mekong delta

Levels		Quantity	Rate %
Very urgent	VCT	262	93,6
	SM	57	81,4
Slightly urgent	VCT	15	5,4
	SM	11	15,7
Not urgent	VCT	3	1,1
	SM	2	2,9

*The implementation of training:* Based on the ideas of vocational college teachers, there is a need to regularly foster the capacity to do technological and scientific research (62,9 %) by different means. There is also an idea that there should be training sections anytime when necessary in order to timely supplement knowledge and skills for vocational college teachers in the process of conducting research. According managerial personnel, vocational college teachers' capacity in technological and scientific research should be fostered periodically (every semester) (45,7%)

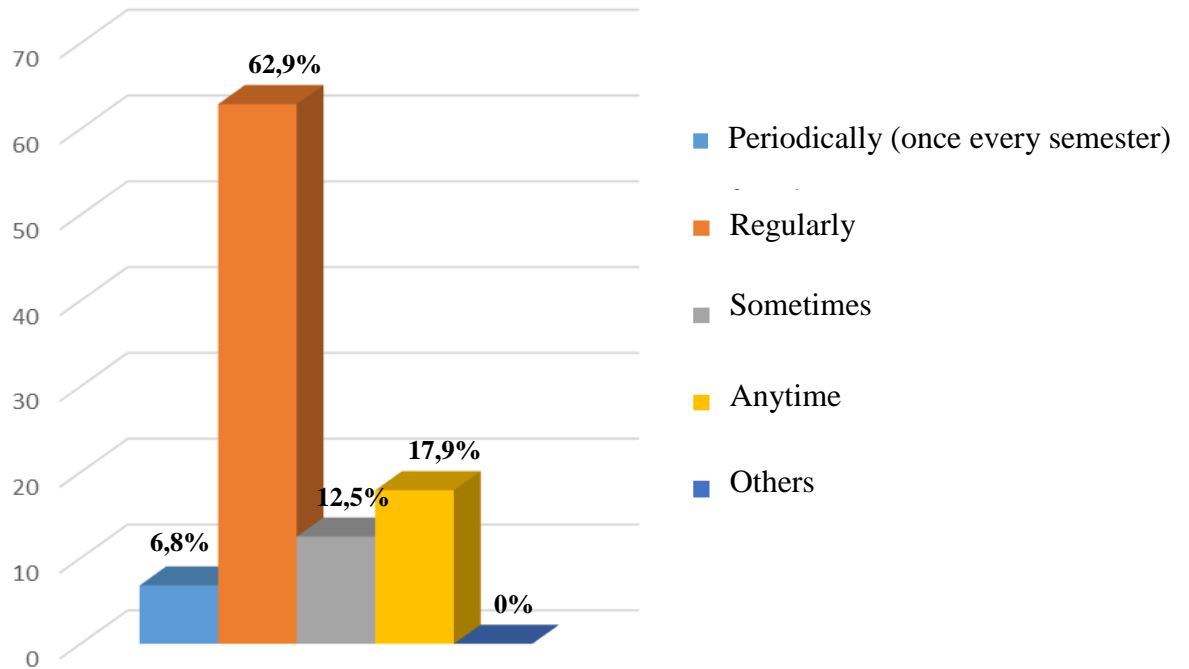


Figure 2.1 The ideas of vocational college teachers on fostering the capacity in technologic and scientific research at vocational colleges in the coming time

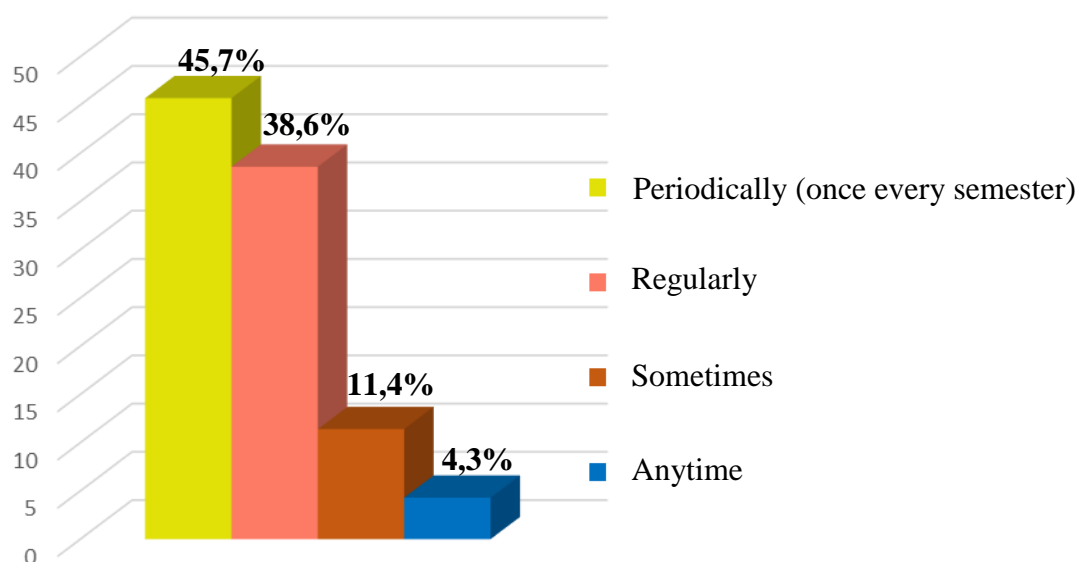


Figure 2.2 The ideas of managerial personnel on fostering the capacity in technologic and scientific research at vocational colleges in the coming time

*The training duration:* The majority of vocational college teachers and managerial personnel state that the most suitable duration of fostering the capacity in technological and scientific research for vocational college teachers is from 1 to 2 weeks (vocational college teachers: 70,7% and managerial personnel: 68,8 %)

Table 2.2 The duration of trainings on the capacity in technological and scientific research for vocational college teachers in the Mekong delta

No	Duration		Quantity	Rate (%)	Rank
1	From 1 to 2 weeks	VTCT	198	70,7	1
		MP	48	68,6	1
2	From 3 to 6 weeks	VTCT	65	23,2	2
		MP	19	27,1	2
3	More than 6 weeks	VTCT	17	6,1	3
		MP	3	4,3	3

*The training contents in technological and scientific research:* The contents that were trained for vocational college teachers in the past focused on the basic skills of technological and scientific research.

*The teaching methods used in the training process:* The ideas of those who were trained on the capacity in technological and scientific research assume that the teaching methods used mainly were discussion (Mean: 2,5) and presentation ones (Mean: 2,4). The method of critical thinking development: Brainstorming, creating mind maps... were hardly employed.

*The training forms of fostering the capacity in technological and scientific research at vocational colleges in the Mekong delta in the past:* The main form is to organize training classes at colleges (Mean: 1,6 (VTCT), 0,9 (MP)). The small number of teachers were trained overseas, but they mainly studied under nation programs and projects (Mean: 0,5 (VTCT) and 0,1(MP)).

*The activities of training the capacity in technological and scientific research at vocational colleges in the Mekong delta in the past:* the majority of vocational training college teachers were not trained on the capacity to do technological and scientific research at vocational colleges. Some colleges sometimes organized training classes at their colleges; however, there were few colleges holding trainings periodically or annually.

*The examination and assessment of the results of training vocational college teachers' capacity in technological and scientific research:* based on the ideas surveyed among 280 vocational college teachers and 70 managerial personnel in 7 vocational colleges in the Mekong delta on the examination and assessment of trainings in the past, the implementation of training was desultorily. Vocational college teachers' capacity in technological and scientific research was not fostered systematically from the first step to the final one; there were not specific standards to examine and assess the training results as well as the training process.

## **2.5 General comments**

### **2.5.1 Strengths**

- The number of teachers who were trained locally and abroad has increased. The training programs for enhancing the capacity of vocational college teachers have been invested and held regularly.
- The professional qualifications in relation to both pedagogy and occupation have also been upgraded significantly. This is a good signal because vocational teachers' capacity is guaranteed in carrying out technological and scientific research.
- New and modern facilities from domestic and overseas projects have also been equipped for vocational colleges. The transfer of technologies from universities, research institutes and service operations has been linked with vocational colleges.
- Vocational teachers have made significant progress in doing technological and scientific research; they have cared about and invested more in equipping themselves with knowledge, skills and attitude in the process of conducting technological and scientific research.
- Vocational colleges in the Mekong delta have had initial steps in taking interest in remuneration policies and regulations in conducting technological and scientific research among vocational college teachers.

### **2.5.2 Limitations**

Although vocational colleges have had trainings on the capacity in technological and scientific research, this is not effective in the sense that such trainings are placed much emphasis on the formality. There are not any plans for implementing trainings regularly or periodically.

- There are not any specific plans as well as training programs. The training needs are not assessed, and the training targets are not identified.
- There is not any analysis of the training needs being carried out, and research issues are not orientated specifically for doing technological and scientific research of colleges in general and individuals in particular.
- The budget for technological and scientific research is limited, with it being inadequate for the research work of colleges.
- Equipment and facilities are not enough, and facilities serving the research work are not invested. Reference materials and libraries did not meet the demand of vocational college teachers when they conduct research.
- The guidelines, policies and regulations of remuneration for vocational college teachers are not specific and clear, and they fail to encourage vocational college teachers to participate in doing technological and scientific research
- Time spent on teaching, learning and doing research is still inappropriate, and vocational college teachers face many problems in arranging timetable.

### **2.5.3 Causes**



- Some vocational colleges in Mekong Delta have not paid much attention to working on research in science-technology.
- Some colleges have not established good procedure to foster as well as manage scientific and technological research within those places.
- There have not been detailed regulations in term of money spent for teachers of each school on conducting research in science and technology.
- There have not been research, analysis, forecast of social needs and relevant parties to determine the content, field to conduct research on.
- Schools have not had evaluation of research in science-technology every year.
- There have not been serious consideration and investment in providing lecturers in vocational colleges as well as encourage them to realize the importance and effect of conducting research in science and technology on teaching and learning activities.
- Teaching methods used to train lecturers' ability to conduct research in science and technology have not been effective enough since they are still passive learning and are not successful in developing learners' interest and creativity.
- Some vocational colleges have not had proper investment in term of facilities used to support learning, training process and conducting research in science and technology of lecturers in vocational colleges. Many schools have not had research in science and technology management software as well as enough resources and references (such as digital library and reference books ...)

### **Conclusion Chapter 2**

1. Vocational colleges have had improvement in training and supporting for lecturers within the schools, including fostering ability to conduct research in science and technology. However in reality, works done recently have not been effective enough since ability to conduct research in science and technology is still at average level. There have not been many research topics; articles, discussions published to inform research results are rare.
2. The number of lecturers participated in scientific and technological research has increased through years. However, comparing to current needs of vocational training, the number of research topics and the number of teachers participated in research are still limited. Challenging happenings within vocational colleges have not been researched.
3. Vocational colleges in Mekong Delta have organized training activities but those activities are not various, not specific enough and not suitable for lectures at vocational colleges. Plans established for training conducting research in science and technology have not met requirements.
4. Although some vocational colleges have paid attention to importance of training ability to conduct research in science and technology of lecturers in vocational colleges, how much money is spent on these activities has not been agreed that causes challenges in organizing training.
5. Some vocational colleges have not been conscious of importance of conducting scientific and technological research as well as training lecturers to do those activities that lead to lack of passion and enthusiasm in scientific activities.
6. Plans for organizing and training lecturers' ability to conduct scientific and technological research should be well considered.
7. From the purposes of conducting scientific and technological research in vocational colleges, there should be analysis in term of needs and aims before establishing training programs.

### CHAPTER 3

#### THE PROCEDURE FOR TRAINING ABILITY TO CONDUCT SCIENTIFIC AND TECHNOLOGICAL RESEARCH FOR TEACHERS IN VOCATIONAL COLLEGES IN MEKONG DELTA

##### 3.1 The principles for solutions proposed and content in training programs to improve ability to conduct research in science and technology for lecturers in vocational colleges in Mekong Delta:

The thesis is based on the following basic principles for proposing solutions: Principles of maintaining organization, principles of scientific characteristics, the principles of ensuring purposes, principles of ensuring practicality and creativity, principles of ensuring feasibility, effectiveness, and principles of ensuring ability to develop.

##### 3.2 Procedure for improving ability to conduct research in science and technology for lecturers in vocational colleges in Mekong Delta

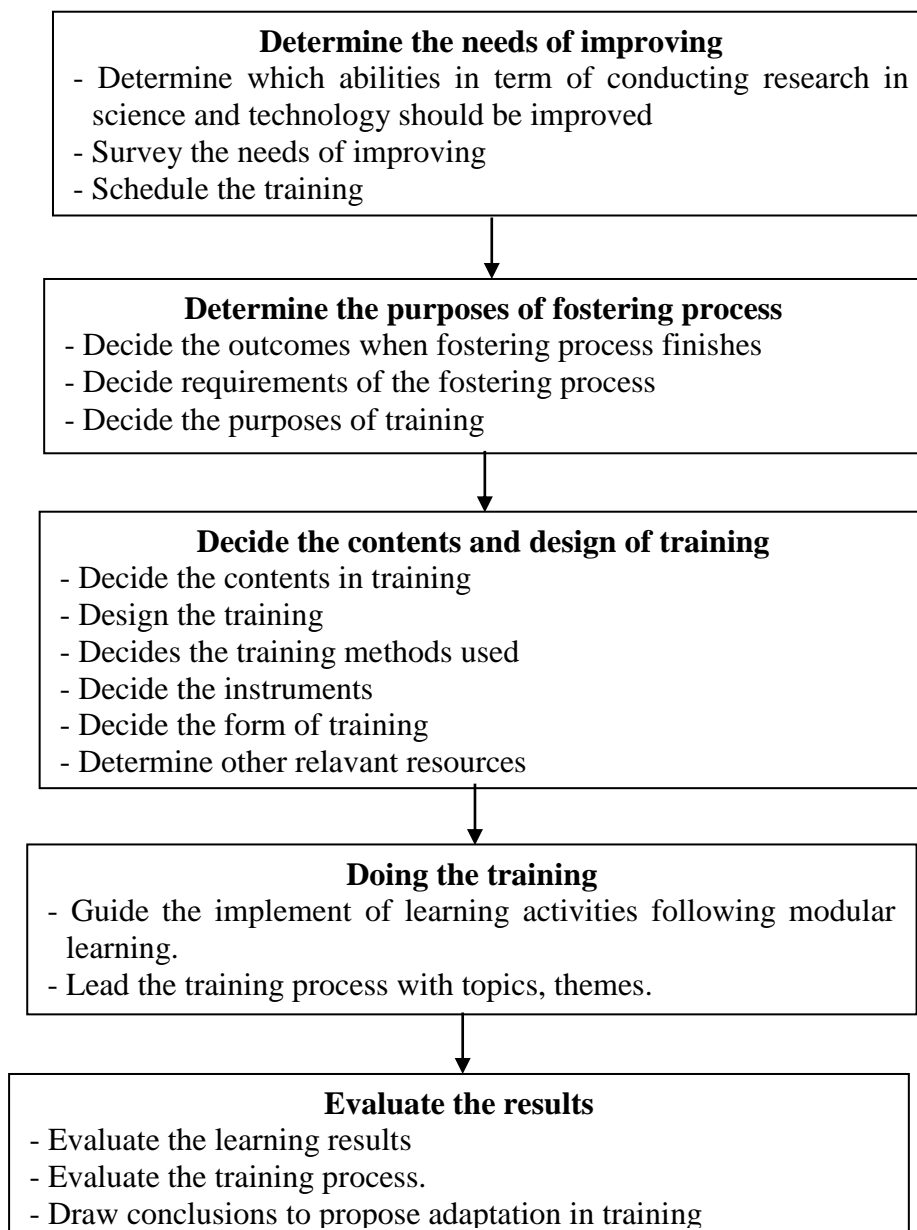


Figure 3.1 Procedure for improving ability to conduct research in science and technology for lecturers in vocational colleges in Mekong Delta

**Phase 1:** Determine the needs of improving

**Step 1:** Determine which research ability in science-technology need improving: Based on characteristics of vocational training, characteristics of research in science-technology of vocational college lecturers, the framework of research ability in science-technology of vocational college lecturers, characteristics of vocational college lecturers in Mekong Delta, research ability in science-technology is determined to foster for vocational college lecturers in Mekong Delta. The thesis suggests research abilities in science-technology which should be fostered as follow: ability in recognizing the problems related to science-technology; ability in choosing and applying suitable research methods in science-technology; ability to write the proposal related to science-technology; ability to design research instruments, survey and data analysis; ability to brainstorm and create things technologically; ability to think critically; ability to think logically; ability to discuss, cooperate and group work; ability to negotiate and present topics in science-technology; ability to write results of topics related to science-technology. In addition, other research abilities could be fostered by organizing training with specific topics given to discuss. For example: ability to analyze, decide sources which could be used in science-technology; ability to design final product, depending on the expected final products, the topics given to discuss would follow requirements of those products.

**Step 2:** Survey the needs of improving: Decide the steps need doing to determine needs of improving, including following steps: step 1) Design research instrument; step 2) Ask for suggestions from other researchers; step 3) Adapt the research instrument and put it into practice; step 4) Collect the data and have data analysis; stage 5) Analyze and evaluate the data; stage 6) Conclude. The overall training process would be based on the conclusions.

**Step 3:** Schedule the fostering process: State clearly steps needed doing to have a successful fostering process for vocational college lecturers.

**Phase 2:** Decide the purposes of fostering process

**Step 4:** Decide the outcomes after the fostering process finished: Based on the analysis of specific jobs of vocational college lecturers and design the standards following the Level 3 of CDIO to establish the outcomes after the fostering process for vocational college lecturers in Mekong Delta finished.

**Step 5:** Decide the requirements of the fostering process: Consider seriously objectives of fostering process, such as: 1) Have basic knowledge in conducting research in science-technology; 2) Be able to conduct the whole process of a research which can be reflected from propose the idea, figure out the problems and decide the name of the research, decide the way to access the problem and research method, establish the proposal, plan stages need following in the research, estimate the money need... 3) Be able to creatively think, think technically; self-study, develop ability to cooperate, group work, presentation ability, negotiate and criticize... for topics done in science-technology. Things mentioned above show ability to conduct research in science-technology of each vocational college lecturer, which are necessary in doing research in science-technology.

**Step 6:** Decide the general objectives and specific objectives of fostering process: Decide the general objectives and specific objectives of fostering process

**Phase 3:** Determine the contents of fostering programs

**Step 7:** Determine the fostering contents: modularize the contents, decide contents needed done to foster research ability in science-technology among

vocational college lectures in Mekong Delta. It is important that the design should follow module design and there is combination between theory and practice to meet the final requirement of the training process. Fostering research ability in science-technology needs to meet the characteristics of each lecturers so that they can gain more knowledge, skills, attitudes towards research in science-technology from which they can conduct research by themselves. Except what have been mentioned, there are other factors needed improved: personal ability, ability to work in group, ability to cooperate, ability to communicate in proper way and also the ability to negotiate when there are orders from other relevant organizations about conducting a research in science and technology... Decide the contents needed fulfilling before organize a training activity: in term of foreign language ability: vocational colleges in general and in Mekong Delta in specific need to have strategies, policy support, plans to improve ability to use foreign languages in various levels in order to support teaching works and research. In term of information and technology: along with plans for improving and self-improving language ability for vocational college lecturers, the vocational in general and vocational colleges in Mekong Delta in specific need to pay attention to improving ability to use information and technology in research and teaching.

**Step 8:** Design the training program: Based on the outcomes agreed and other requirements needed to establish training program for vocational college lecturers in research in science-technology mentioned above, the thesis proposes the idea of fostering research ability in science-technology for vocational college lecturers in Mekong Delta following specific ability.

Table 3.1 The training program to enhance ability to research in science-technology for vocational college lecturers in Mekong Delta

<b>Module code</b>	<b>Module name</b>	<b>Time period (hours)</b>
MH01	Develop creative thinking, technical thinking	12 hours
MH02	Develop a detailed outline for topics in science-technology	24 hours
MD03	Select sample and design survey tools and process data	24 hours
MH04	Develop ability to present, negotiate	10 hours
MD05	Develop critical thinking and logical thinking	10 hours
MD06	Enhance ability to communicate and group work in group	8 hours
MD07	Write report	8 hours
	<b>Total</b>	<b>96 hours</b>

**Step 9:** Select the training method: the frequently used teaching method and learning activities used to foster research ability in science-technology for vocational college lecturers in Mekong Delta. These methods affect the motivation, cognition of each learner and enhance the best the ability of each person participated in training process.

**Step 10:** Select instruments used in training process: Decide suitable teaching instrument and learning for specific groups of learner as well as fit the requirements of training program.

**Step 11:** Decide the form of training: Based on following aspects: 1) Based on time of training program: short-term or long-term: two-week training, short-term

training: (the fostering process happening follows topics of specific subjects): one to two-day training; 2) Workshops, seminars, practical tours; 3) Self-training; 4) Distant study.

**Step 12:** Determine other relevant resources and ensuring conditions: To avoid training without meeting the requirements in term of quantity and quality, the training process related to research in science-technology should follow the conditions: select suitable instructor for the training; determine target learners; contents; time, number of vocational college lecturers to participate in training; facilities for training process; decide the basis of the training; encourage training and self-training with policies.

**Phase 4:** Doing the training

**Step 13:** Guide the implementation of learning activities follow modular training: At this step, the thesis choses module 2: Develop a detailed outline for research topic in order to organize learning activities in the training process such as: Activity 1: Divide into groups to do research; Activity 2: Guide the selection of idea to research; Activity 3: Guide to choose suitable research method; Activity 4: guide how to choose sources for reference; Activity 5: Guide how to develop proposal for the topics chosen by each group.

**Step 14:** Lead the training process with topics, themes: Besides instructing learning activities following modular learning in class, training can also happen by giving topics in and do training with project-based method to foster research ability in science-technology for vocational college lecturers in Mekong Delta. This training method can be done by suggested steps: Step 1) Develop a system of research topics related to science and technology that suit specific professions; Step 2) Divide into small groups and provide them with topics; Step 3) Each group develop the process to implement the topics; Step 4) Search, select relevant information to the topics; Step 5) Based on personal experiences and ability to develop the detailed proposal for topic; Stage 6) Conduct the research; Stage 7) Writing the report of the results of the research; Stage 8) Report and conclude.

With this form of training, after finishing research, individuals will develop their ability in self-study, self-research. From that each vocational college lecturer gain some more experiences, in the meantime they can develop logical thinking, critical thinking, and develop ability to research in science-technology area.

**Phase 5:** Evaluate the results

**Step 15:** Evaluate the training results: Evaluation Criteria is important to measure **learner's** ability after the training process. Because, the training program is developed follow specific ability of each learner, the evaluation criteria and assessment toolkit are based on the outcomes set at the beginning of the training to assess progress of each learners through the training.

**Step 16:** Evaluate the progress and training results: To ensure the training progress meets the requirements, during the training period, instructors and learners need to **complete** short quiz test and teaching and learning activities are evaluated through classroom activities and products got from each session. Instructors guide and evaluate the way learners perform classroom activities through problem-solving tasks conducted during the learning process.

**Step 17:** Review, conclude and propose adaptation to the training process. Assess and **evaluate** results of training process by delivering evaluation forms and process of organizing training courses. This assessment was held immediately after the

assessment of learners' outcomes. The participants participated in evaluation include instructors in the course, learners, people in charge of managing the training course.

### 3.3 Piloting

**3.3.1 Purposes:** *To verify the validity of assumptions, assess the results of the implementation of the objectives, content of the training program.*

**3.3.2 Participants:** *30 lecturers in Can Tho Vocational College*

**3.3.3 Piloting content and procedure:**

**3.3.3.1 Piloting content:** Teaching and learning two modules in the program.

**3.3.3.2 Procedure:** include following steps: Determine the quantity and measure the level of participants; Make initial survey about ability of participants; Organize, arrange and prepare instruments for place where piloting happens; Start piloting follow the contents of two modules: (module 1 and module 2).

**3.3.4 Assessing tools and methods used to evaluate test results**

**3.3.4.1 Assessing tools:** Assess using common assessing tools such as: evaluation form at the beginning of the course; frequent assessment during the training; evaluation form at the end of each module; evaluation form when learners finish their products.

**3.3.4.2 Evaluation method and evaluation standards:** Evaluation is based on qualitative and quantitative analysis. Develop standards and scale to evaluate research ability in science-technology.

**3.3.5 Summarize the test results:**

\* Test result of module 2:

- Define characteristic parameter

Statistical results describe the research ability and its components in relation to module 2 before and after the training course.

Table 3.2 Statistics of characteristic parameters of module 2 before and after the training

Parameter	Before	After
Mean	59,857	84,807
Standard Error	2,6597	2,0447
Median	56,5	87,4
Mode	43,6	59,9
Standard Deviation	14,5677	11,1992
Variance	212,218	125,423
Range	46,6	39,9
Minimum	43,6	59,9
Maximum	90,2	99,8
sum	1795,7	2544,2

Table 3.3 Table about the distribution of score from module 2

Group	Total	Score					
		[40;50)	[50;60)	[60;70)	[70;80)	[80;90)	[90;100]
Before	30	10	8	4	4	3	1
After	30	0	1	3	5	9	12

Description of the parameter showed the average score after finishing module 2 is higher than score at the beginning. The thesis conducted comparing average scores

between two modules before and after training process, which implies that differences are meaningful to the training process.

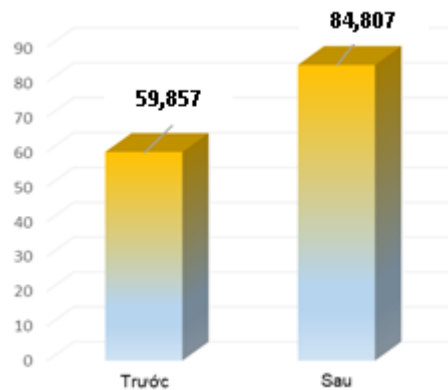


Figure 3.2 Comparison of average score of module 2 before and after the training process

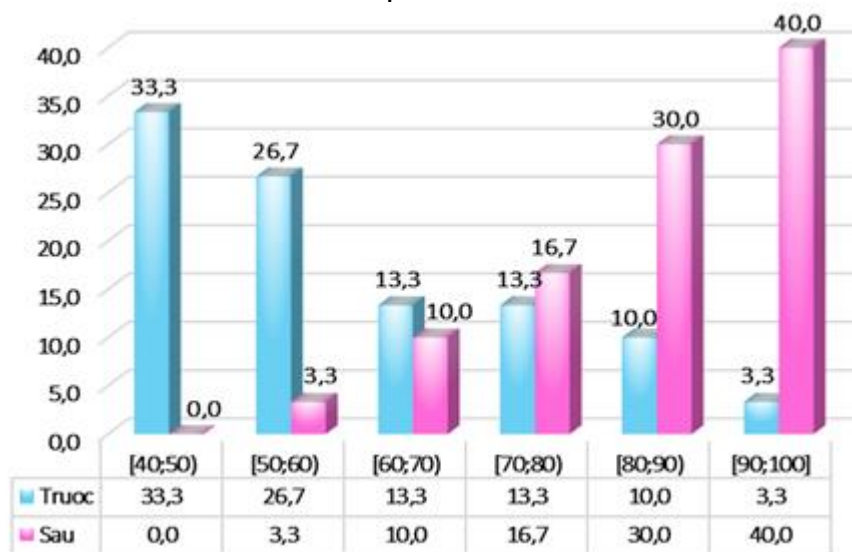


Figure 3.3 Frequency of score at the end of module 2

The data in tables and figures above indicate the frequency of scores after vocational college lecturers finished module 2 which compare before and after result. This indicates score at the beginning of module 2 range from [40;60] and at the end of module range from [80;100].

Comments: The results after analysis showed that the average value of partial abilities in module 2 are much higher than partial abilities before training. Standard error of partial abilities after training is lower. This is proven in focus of score before and after the training. Through characteristic parameter, thesis comes to conclusion that partial abilities of module 2 are improved after training.

\* Test results of module 3

Identify characteristic parameters. Results describe before and after results of specific partial ability.

Parameters	Before	After
Mean	66,630	85,933
Standard Error	2,8443	1,8635
Median	65,7	88,9
Mode	44,8	84,2

Standard Deviation	15,5790	10,2068
Variance	242,705	104,178
Range	50,2	31,1
Minimum	44,8	68,0
Maximum	95,0	99,1
Sum	1998,9	2578,0

This result showed mean, median, the value after training is higher than before training. From this first beginning, the effectiveness of the training has been confirmed.

The description of parameters showed that, the average scores of module 3 after training is higher than before training. The thesis began to compare average score of module 3 after and before training, the differences showed has some value in training program.

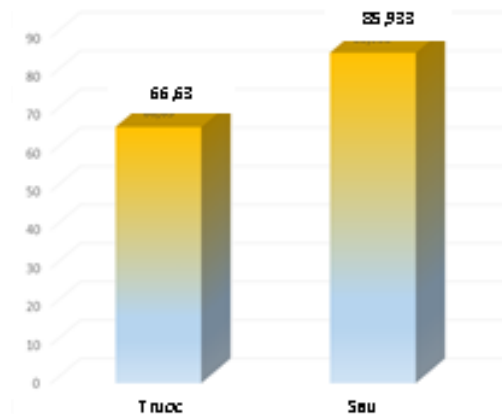


Figure 3.4 Comparison of average scores of module 3 after and before training.

Table 3.5 Table about distribution of scores in module 3

Group	Total	Score					
		[40;50)	[50;60)	[60;70)	[70;80)	[80;90)	[90;100]
Before	30	3	9	7	4	4	3
After	30	0	0	3	6	8	13

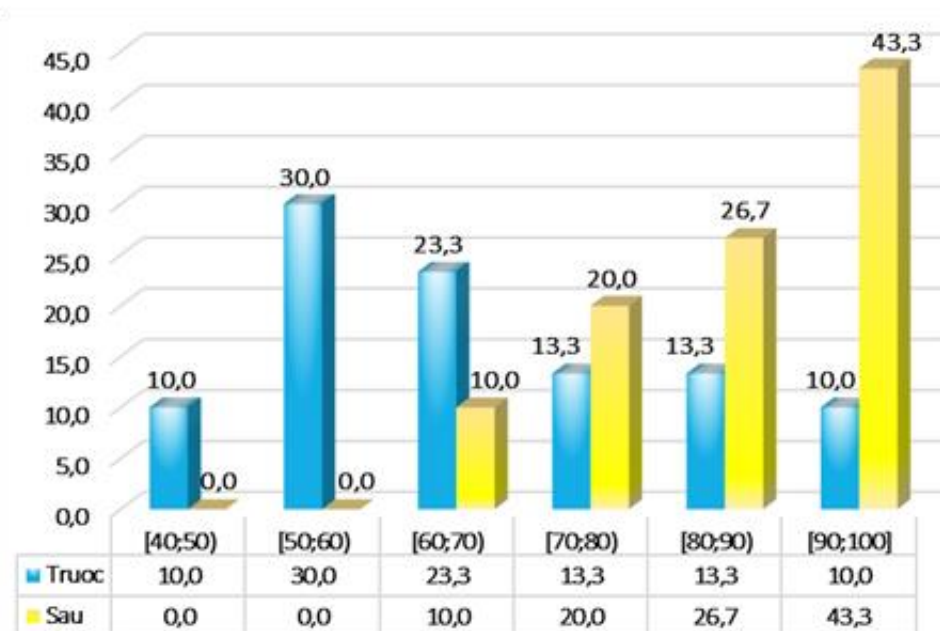


Figure 3.5 Frequency of score at the end of module 3



The value in tables and in figures show the frequency of score appearing in module 3 of vocational college lecturers before and after training. From the result, the score of module 3 before training ranges from [50;60] and after training, the score is around [80;100].

Basing on the results got from the piloting process, ability to choose topics to research, propose detailed proposal, create assessment method are important. The final resources show progress in teaching and learning. This proved that when training focuses on specific ability, research ability in science-technology of vocational college lecturers in Mekong Delta has increased.

### **Conclusion of chapter 3**

1. In order to strongly enhance technological and scientific research at colleges in the Mekong delta, it is very necessary to foster the capacity in technological and scientific research for vocational college teachers.

2. The targets of fostering the capacity in technological and scientific research for vocational college teachers in the Mekong delta is established under the capacity approach based on the results of vocational analysis and the outcome standards of CDIO that are appropriate to the technological and scientific research work of teachers at vocational colleges.

3. There is a need to build a program of training the capacity in technological and scientific research which fits the capacity of the teaching staff at vocational colleges, while being also suitable to research fields required by colleges, the society and all sides related to the domain of vocational training. In other words, the program of training the capacity in technological and scientific research for vocational college teachers needs to meet the outcome standards under the capacity approach.

4. Fourth, according to the experiment results, the proportion of vocation college teachers who attain the capacity is quite high compared to the time before they are trained. From which, it is proved that the vocational college teachers' capacity in technological and scientific research has been improved, whereas the rates of average and weak capacities have decreased. These are important results that initially demonstrate the efficacy and feasibility of solutions to fostering the capacity in technological and scientific research for vocational college teachers in the Mekong delta in particular and vocational teachers in general.

## **CONCLUSION AND RECOMMENDATIONS**

### **1. Conclusion**

From the research results of the thesis "Fostering vocational college teachers' capacity in technological and scientific research", the researcher could draw the following conclusions:

- In the theoretical perspective:
  - + Technological and scientific research is a highly intellectual activity, with it helping vocational college teachers a great deal in teaching and professional development.
  - + The training on the capacity in technological and scientific research for vocational college teachers is very necessary to enhance the research work at vocational colleges, while contributing to improving the quality of vocational teaching in the period of economic development and integration.
  - + The characteristics of vocational training and pedagogical activities of vocational college teachers are the foundations for technological and scientific research at vocational colleges. Upon which, the capacity framework for technological and

scientific research at vocational colleges can be established. Contrasting the capacities with the contents of technological and scientific research at vocational colleges to identify which capacities need to be trained for vocational college teachers.

- + The training on the capacity in technological and scientific research is a route of developing critical thinking and intellectuality in an independent way, and it is implemented based on a specific process to guarantee that the research work of vocational college teachers is developed on its strengths and is conducted effectively. The targets, programs, contents, methods and conditions for carrying out the training process are specifically identified according to the capacity approach to ensure that vocational college teachers can reap benefits when participating in technological and scientific research.

- + The factors influencing the process of fostering scientific-technological research ability in teachers of vocational colleges are the issues that need to be concerned about when we propose the solutions for the research capacity in science - technology of teachers of vocational colleges

- Aspect of practicality: Thanks to the research findings (surveying, communicating, and interviewing), the researcher comes to the following conclusions:

- + The number of teachers of vocational college participating in the activities of scientific- technological research is still limited, and so are the research topics, which only focus on the levels of departments, divisions, groups and schools. Very few of them are on higher levels.

- + The number of scientific products such as articles, speeches, specialist books made by the teachers of vocational college in the Mekong Delta is too small.

- + According to the survey, research capacity in science - technology of teachers of vocational colleges in the Mekong Delta, at present, is at a low level (considered as a low-medium level).

- +Some Vocational-training colleges, the teachers and the school administrators in the region almost do not have any activities of STR.

- + Activities of fostering research capacity in science - technology in the teachers of vocational colleges in the region are separately organized, even some have never organized any before.

From this reality, there must be several solutions of fostering research capacity in science - technology in teachers of vocational colleges to meet the social requirements in terms of STR activities, and make contributions to improving research capacity in science - technology for teachers of vocational colleges in the whole region.

When collecting ideas about the necessity and feasibility levels of the two solution groups, and conducting a trial with 2 modules in the program of fostering research capacity in science - technology in the teachers of vocational colleges, the effectiveness and the feasibility of the two solution groups have been assured.

In conclusion, thanks to the findings in the dissertation, it is concluded that the solution groups for fostering research capacity in science - technology in teachers of vocational colleges in the Mekong Delta are suitable for the goals of training and fostering, which follow the approaching method (CDIO and NLTH), helping develop creative and technical ways of thinking as well as personal abilities of socializing, presenting, negotiating, and group-working with other individuals in the activities of STR, which helps meet the requirement between the individuals in relation in vocational-training activities.

## 2. Recommendations

*- To the Ministry of Labor, War Invalids and Social Affairs; the Vocational-training Central Board; and the leaders of different levels in provinces/ cities in the Mekong Delta*

➤ Needing the guidelines, policies of encouragement in terms of the activities of Scientific-technological research for vocational-training schools, centers, and branches.

➤ Needing the budget for applications of scientific technological research in job-education for the whole country in general and the Mekong Delta in detail.

➤ Needing the budget for equipment, machinery serving the activities of scientific technological research in Vocational-training schools.

➤ Proposing competition movements in scientific technological research fields between vocational-training schools, centers and branches.

➤ Holding the informal talks, the scientific workshops with specialist subjects to present and exchange ideas, co-operate with each other between Offices of Science and Technologies, Offices of Labor, War Invalids, and Social Affairs, vocational-training schools, centers, branches, research institutions... in the activities of scientific technological research in the vocational-training field.

➤ Needing the budget for organizing the activities of training, fostering about STR in teachers of ... in general and teachers of vocational colleges in detail.

➤ Needing the plans for training and fostering the teachers of .... within the country and overseas.

➤ Promulgating the texts about programs of fostering for scientific technological research.

➤ Needing linking policies between vocational-training schools, places of business and production and services in the activities of scientific technological research.

*-To the leaders of Vocational-training schools in the Mekong Delta*

➤ Needing to establish the regulations, texts which stipulate clearly and specifically the activities of scientific technological research in schools.

➤ Needing plans for providing expenditure for the activities of scientific technological research in schools.

➤ Needing policies to treat and reward teachers of vocational colleges who enthusiastically take part in scientific technological research.

➤ Needing to propagandize and campaign regularly to show people the importance of scientific technological research and provoke the passion of scientific technological research for the staff in schools.

➤ Specifically directing the field of research which is vital for the development of the schools and order-forms from places of business, production and services annually.

➤ Needing to provide expenditure and make specific plans for fostering research capacity in science - technology for the teachers in schools

➤ Needing to foster research capacity in science - technology in teachers of vocational colleges in each year and in every stage of research.

➤ Needing to organize informal talks about scientific technological research between vocational-training schools, universities, research institutions, places of business, production, and services.

➤ Needing policies of supporting and encouraging the teachers of vocational colleges to self-study, self-foster about their specialist knowledge.

**For vocational college lecturers in Mekong Delta**

- Need to raise awareness of importance of research in science-technology and consider it responsibility of lecturers.
- Raise the cooperation, sharing, discussion with colleagues on doing research in science-technology.
- Raise the awareness of improving ability in research in science-technology by frequently conducting research. This is also a way for lecturers to improve personal skills, prove reputation and ensure quality of teaching, raise the reputation of schools.
- Raise the awareness of the importance of research activities in science-technology and enhance research ability in science-technology through training, self-training in field of vocational training.

## **LIST OF PUBLISHED SCIENTIFIC WORKS**

1. Le Thi Tho (2014), *Scientific basis of technology - scientific research capacity of vocational college lecturers*, *Education Journal*, No 327.
2. Le Thi Tho (2015), *Proposed the models of fostering scientific research capacity in the direction of CDIO approach for vocational colleges lecturers in Mekong Delta region*, *Education and Social Magazine*, Special Issue 9/2015.
3. Le Thi Tho (2015), *Some issues of improving capabilities of scientific research - technology for vocational college lecturers in Mekong Delta region*, *Education Journal* No 366.