MINISTRY OF EDUCATION AND TRAINING
HANOI NATIONAL UNIVERSITY OF EDUCATION

----- ✪ ★ ✪ -----

NGUYEN THI THANH HUYEN

DESIGNING AND EMPLOYING THE TECHNICAL ANALYSIS PROBLEM IN TEACHING THE COMBUSTION ENGINE AND AUTOMOBILE SUBJECT FOR TECHNOLOGICAL PEDAGOGICAL STUDENTS

Major: Technolofy Teaching Methodology
Code : 62 14 01 11

SUMMARY OF EDUCATIONAL DOCTORAL THESIS

HANOI – 2018

The doctoral thesis was done

at Hanoi National University of Education

Scientific advisor: ASSOC. PROF. DR. NGUYEN TRONG KHANH

Reviewer 1: Assoc. Prof. Le Hong Quan

Hanoi University of Industry

Reviewer 2: Assoc. Prof. Nguyen Thanh Quang

Hung Yen University of Technology And Educati on

Reviewer 3: Assoc. Prof. Ta Thi Phuong

Hanoi National University of Education

Defense of the dissertation will take place at the open meeting of Counsil

for doctoral thesis at Hanoi National University of Education

at ..... am/pm date.....month.....year 2018

The thesis and its summary are avaiable at the library of:

- Hanoi National University of Education
- National Library

INTRODUCTION

I. THE REASON FOR CHOOSING THIS SUBJECT.

Resolution 29-NQ/TW issued by the 8th XI term Central Executive Committee insists, "Comprehensively reform teaching and studying methods orienting modern; promoting activeness, initiative, creativity, and skills of learners; eliminating one-way education and passive studying. It must focus on teaching and thinking and promote self-studying in order to foster learners in acquiring latest knowledge, skills, and capability."

In the modernization era, with the context of abundant knowledge and the rapid development of technology, education and training should comprehensively reform in contents, curriculums, as well as training methods. Teaching is not simply providing knowledge, but also organizing intellectual activities to form, precise, and bolter learners' intellectual capability.

In accord with active teaching orientation, teachers should transform themselves from lecturers to consulters, who pose the problem, instruct students, give insight, and support them to discover, analyze, and solve the problem. In those activities, problematic situations and cognitive problems are effective tools.

The technical analysis problem (TAP) is a type of cognitive issues employing in technical training. With its own characteristics, the TAP aids students deeply understand the problem, thus, acquiring new knowledge and developing technical thought. However, the constructing theory for the TAPs as well as developing and employing them in technical training are somewhat not in a proper degree. Particularly, in the field of teaching combustion engine and automobile for technical teachers, the construction and employment of the technical analysis have not gotten enough the attention of scholars. For these reasons, the author decided to pick her field of doctoral research as **"*Designing and employing the technical analysis problem in teaching the combustion***

***engine and automobile subject for technical pedagogical students*.”**

II. THE PURPOSE OF THE RESEARCH.

Studying the reasoning about the TAP, designing, and applying it in teaching the subject combustion engine and automobile for technical pedagogical students, thus, enhancing the quality and the effectiveness of teaching.

III. THE OBJECT, SUBJECT, AND THE AREA OF STUDY.

1. The object of the study: The process of teaching the combustion engine and automobile subject in training technical pedagogical students.

2. The subject of the research: Technical problems, technical analysis problems, and the process of teaching the combustion engine and automobile subject.

3. The area of the study: Designing and employing the TAP in teaching the combustion engine and automobile subject for technical pedagogical students.

IV. SCIENTIFIC HYPOTHESIS.

Designing and employing the TAP in teaching the combustion engine and automobile subject for technical pedagogical students will develop their technical thoughts, thus, enhancing the quality and effectiveness of teaching.

V. STUDYING TASKS.

1. Studying the basis reasoning of the technical analysis, in which centralizes the TAP and its role in developing the learners’ technical thoughts and improving the quality and effectiveness of technical training.

2. Research the process of teaching the combustion engine and automobile subject in training technical pedagogical students.

3. Propose a plan for designing and applying the TAP in teaching the combustion and automobile subject to enhance the quality and effectiveness of teaching.

4. Design the procedure and constructing a system of technical analysis problems about the combustion engine and automobile subject; proposing a procedure to apply that system for training technological pedagogical students.

5. Assessing and evaluating the applicability and effectiveness of the proposing method.

VI. STUDYING METHODOLOGIES.

1. The author employs various theoretical studying methods such as analysis, synthesis, classification, systemization, schematization, etc. to study topics relating psychological thinking, teaching reasoning, and technical problems in order to build the principle reasoning of the topic.

2. She also applies practical methods like questionnaires, pedagogical experiment, and professional methodologies to survey the reality, assess, and evaluate the proposed methods.

3. The author uses mathematical statistics to carry out field survey, assess, and evaluate the proposed methods.

VII. NEW CONTRIBUTIONS OF THE THESIS.

1. The thesis has built a theoretical system of the TAP and employed it in teaching. The thesis focuses on constructing concepts and characteristics of the TAP. It has also constructed a procedure of designing and employing the TAP in teaching and assessing the developing level of technological thought in learners. It builds the criteria assessing the developing level of learners' technical thought.

2. Through carrying out the thesis, the author surveyed and evaluated the reality of teaching the combustion engine and automobile subject in terms of designing and applying the TAP.

3. From the proposed procedure, the author has built the system of technical analysis problems to apply in teaching the combustion engine and automobile subject.

The outcome of the thesis can contribute to enriching the reasoning of the technical problem; it also gives insight to enhance the quality in teaching the combustion engine and automobile subject.

VIII. THE STRUCTURE OF THE THESIS.

The thesis consists of three main chapters, summary, recommendations (126 pages), 14 tables, and 16 figures. Other than that, it provides the introduction (5 pages), references (80 items), appendix (33 pages), and proposed problems (25 problems).

Chapter 1: Theoretical basis of designing and employing the TAP in teaching.

Chapter 2: Practical basis of designing and employing the TAP in teaching combustion engine and automobile.

Chapter 3: Designing and employing the TAP in teaching combustion engine and automobile.

These chapters cover 121 pages including 13 tables and 16 figures. Besides, the author also provides with the introduction (5 pages) and the references (81 pages).

THE MAIN CONTENT OF THE THESIS

Chapter 1

PRACTICAL AND THEORETICAL BASIS OF DESIGNING AND EMPLOYING THE TECHNICAL ANALYSIS PROBLEM TEACHING

1.1 GENERAL CONCEPTS OF THE DESIGNING AND EMPLOYING THE TECHNICAL PROBLEM IN TEACHING

This chapter briefly presents the general concepts of designing and employing the cognitive problem, the technical problem, and the TAP of domestic and international researchers.

The study shows that technical problems play an very important role in developing learners' technical thought and enhancing technical training quality. There are various types of technical problems, in which the TAP has not been studied in terms of theory as well as application in teaching.

1.2 PRINCIPAL CONCEPTS

1.2.1 Technical Analysis

The thesis presents some relating concepts such as: system, analysis, technique and the concepts of "technical analysis": in other words, *it is the classification of one technical object (technical items) or a technical process (technical phenomena, technical developments, technical processes, etc.) into elements in order to study each of those and the connections and impacts among them with the ultimate purpose is to explain, improve, and develop that object or technical process.*

Technical objects are terms showing technical products while technical process is a term showing phenomenon and the development of technical objects.

One of the main tasks of technical analysis is to explain the structure of technical objects and or the development and process of the technical phenomenon. The structural analysis of technical objects clarifies the shape, dimension, weight, material, and connecting characteristics of those objects. Analyzing technical processes explains the developments and causes of abnormal phenomena and the predestined outcome of that technical process.

1.2.2. The technical analysis problem

1.2.2.1. The Technical problem

This part of the thesis presents the outcomes of the study about the technical problem. Thus, the author points out that the TAP is a type of technical problems, yet it has not been studied in the field of concepts, characteristics, structure, as well as the process of designing and employ for technical training.

1.2.2.2. The concept of the technical analysis problem

This concept is constructed on the combination of two concepts: the technical problem and the TAP. *This means the technical problem, a derivation of technical problems, which requires explaining the technical structure or*

technical process. The process of problem solving employs operations and forms of thought mostly including analysis, synthesis, and deduction.

1.2.2.3. Characteristics of the technical analysis problem

The TAP mostly inherits the characteristics from the technical problems. However, it possesses following particular characteristics:

- The TAP often misses datum or has vague datum.

- The TAP is often qualitative; it requires logical arguments rather than accurate calculation.

- Objects or issues of the TAP must have components that have cause and effect relations in a certain rule or logic.

- The TAP sometimes requires both knowledge and experience to be solved.

1.2.2.4. The structure of the technical analysis problem

Because of its qualitative feature, the TAP possesses unique characteristics and structure. Generally in terms of structure, a TAP consists of following components (Figure 1.1):

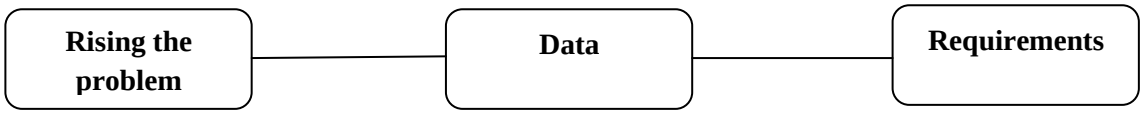

Figure 1.1 The structure of a TAP

- *Rising the problem:* information hooking learners to concentrate on observing and analyzing the problem.

- *Data:* scientific basis and boundaries of the problem to give insight and orientate learners in solving them.

- *Requirement:* the problem's task that needs to be solved.

1.2.2.5. Classifying the technical analysis problem

Basing on the concepts of technical analysis, the main tasks of technical analysis, and the TAP's concepts, the TAP is devided into two following groups:

- *The technical structural analysis problem*
- *The technical processing analysis problem*

1.2.2.6. The role of the TAP in developing learners' technical thought

Technical training along with its characteristics consists of following main roles:

- Aiding students systematically acquire new knowledge
- Inspiring the cognitive process and enhancing the activeness, independence, patience, and science of students.
- Contribute in providing new knowledge.
- Form and cultivate the skills of employing knowledge.
- It is a vital tool for revising and systematizing knowledge.
- It develops students' thought, especially technical thought.

In short, the TAP's characteristics play an important pole in developing learners' technical thought.

1.2.3 Technical thought

This part briefly presents the theory of technical thought and establishes criteria assessing the developing level of technical thought. They are:

- The ability to find the problem and solving problem rate, specially, the proper and creative solution.
- The precision and logical arguments in the solution.
- Creative solutions that are not mentioned in the curriculums.

1.3 DESIGNING AND EMPLOYING THE TECHNICAL ANALYSIS PROBLEM IN TEACHING

1.3.1. The scientific basis of designing and employing the technical analysis problem

Designing and employing the TAP must base on following scientific basis:

- The purpose of using the TAP
- The requirement for the TAP

- Reasoning forms of thought
- Other factors such as, goals, contents, teaching conditions, etc.

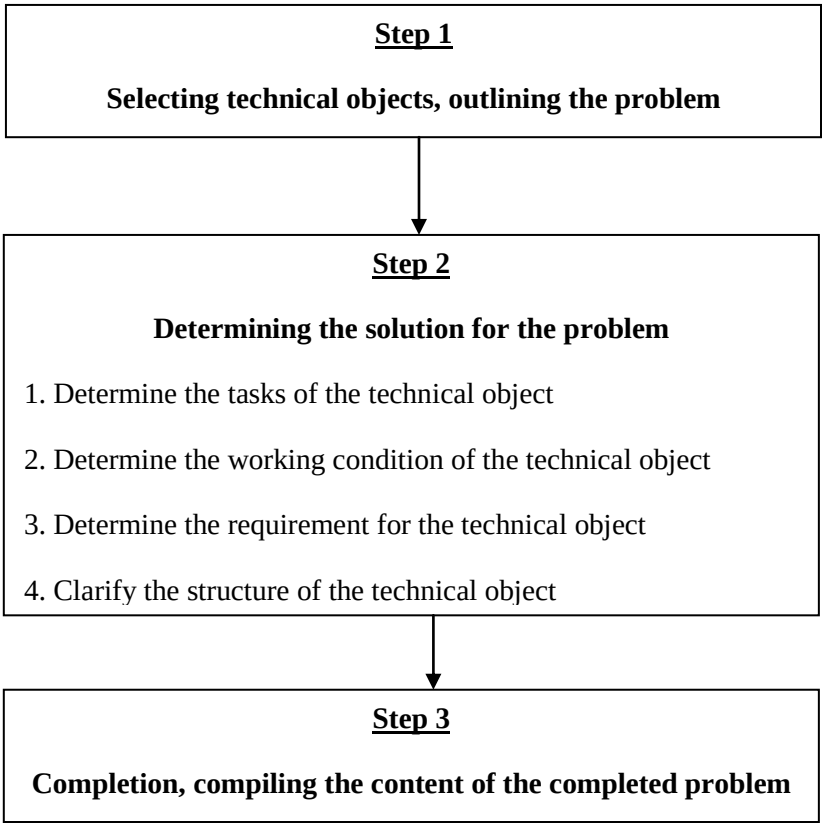

Figure 1.2 The procedure of designing the technical structural analysis problem

1.3.2. Designing the technical analysis problem

The thesis establishes the procedure of designing the two types of TAP. Each type is different in their steps and methods as shown in figure 1.2 and 1.3.

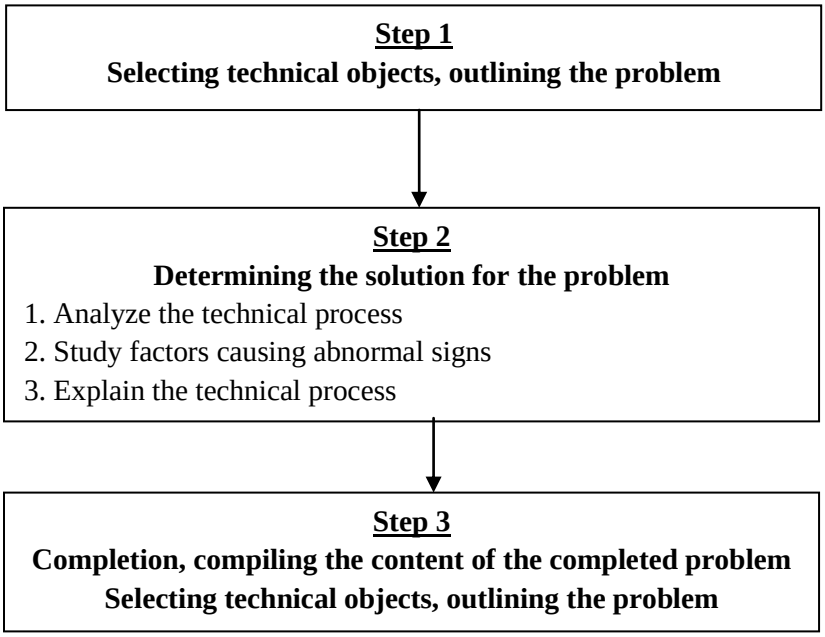

Figure 1.3 The procedure of designing the technical processing analysis problem

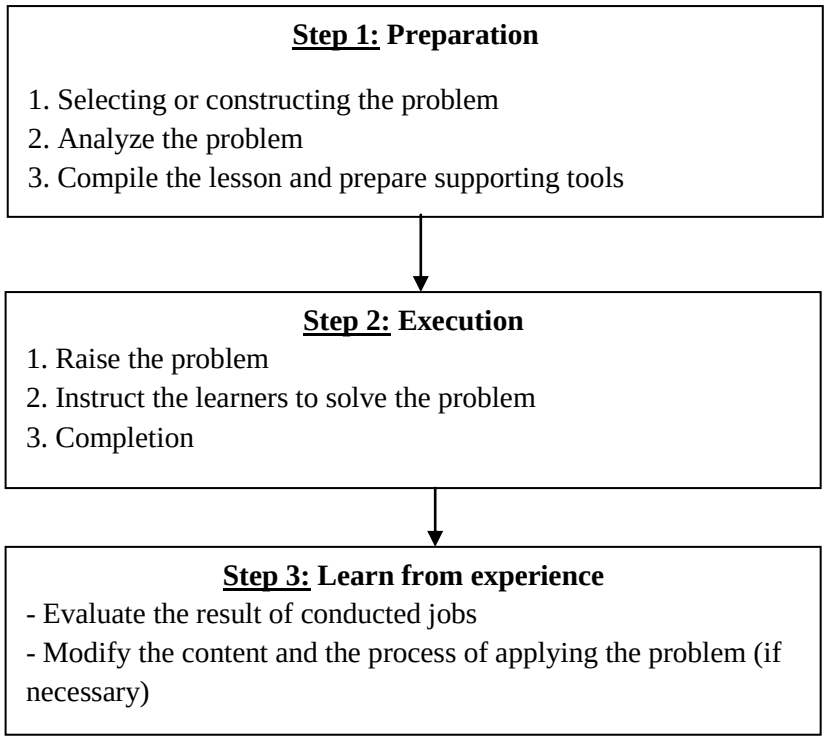

Figure 1.4 The procedure of employing the technical analysis problem

1.3.3 Employing the technical analysis problem in teaching.

Because of the diversity of the TAP and its undemanding conditions in the point of employment, each problem can be used by different ways. However, in general, the employment of the TAP can be carried out in three steps as seen in figure 1.4.

1.4 THE REALITY OF TEACHING THE TAP IN SCHOOL

The thesis has surveyed the reality of employing the TAP in technical training, especially for the internal combustion engine and automobile subject at prestigious training facilities, such as Ha Noi Polytechnic University, Ho Chi Minh City University of Technology and Education, Hung Yen University of Technology and Education, Military Technological Academy, etc.

The result indicates:

- The teaching of the combustion engine and automobile subject mostly mentions the structures and principles, but does not explain structures, processes, or development due to time constraints. Several problems ware presented in the form of a problem containing problems; however, it failed to distinguish the problem with the TAP.

- The requirement in assessing and evaluating mostly is the presentation of structures and principles, but does not require the technical analyis.

- Most teachers did not know or focus on designing and employing the TAP for teaching.

Overall, the theory of the technical problem and the TAP was not in the proper consideration to apply for teaching.

Summary of chapter 1

Through studying the reasoning of constructing and employing the TAP in technical training, there are several identify:

1. The cognitive problem in general and the TAP in particular are a teaching content. It plays a significant role in teaching, revising, and examining students. Specially, if it is constructed, built, and applied properly, the TAP will

boost technical capability and thought of learners. Because the process of solving the TAP not only solidifies knowledge and sharpens the skills of students, but also develops their technical thought.

2. The TAP is a type of technical problems with all of their characteristics. This problem suits various contents of technical subjects. In order to construct TAPs, it must build a general procedure. The procedures shown in figures 1.2 and 1.3 are established through analyzing the reasoning of constructing the technical problem and generalizing the real teaching experience.

3. The TAP is a suitable with contents and specialized knowledge of specific technical branches. In order to construct the TAP, there is a need to establish a general procedure. Basing on analyzing the teaching reasoning and the outcome of the study about the employment of cognitive problems, the thesis has established the procedure of applying the TAP in technical training.

4. The thesis has built some criteria applying in assessing the developing level of learners' technical thought. .

5. The field survey shows that technical analyzing in teaching is necessary and important. However, constructing and employing the TAP have been separately done by individuals based on experience, but not in a comprehensive and systematic way, thus, bringing about ineffective outcomes.

The outcome of theoretical and practical shows that it is urgent to design and employ the TAP in technical training, especially in the combustion engine and automobile subject.

Chapter 2

DESIGNING AND EMPLOYING THE TECHNICAL ANALYSIS PROBLEM IN TEACHING THE COMBUSTION ENGINE AND AUTOMOBILE SUBJECT

2.1 THE POTENTIAL OF DESIGNING AND EMPLOYING THE TECHNICAL ANALYSIS PROBLEM IN TEACHING COMBUSTION ENGINE AND AUTOMOBILE.

2.1.1. Characteristics of the content and teaching process of the combustion engine and automobile subject.

This part presents characteristics of the content and teaching process of the combustion engine and automobile subject.

2.1.2. The requirement to design and employ the TAP in teaching the combustion engine and automobile subject.

Through studying the reasoning about the TAP, the content of the combustion engine and automobile subject, the reality of teaching the subject, and the feedbacks from specialized teachers, it is possible to construct technical analysis problems concentrating on combustion engine and automobile.

2.1.3. The teachers' capability of designing and employing the TAP in teaching the combustion engine and automobile subject.

The survey indicates if there is a procedure of designing and employing to implement, publicize, and instruct, the training team is capable of constructing and employing the TAP.

2.2. DESIGNING THE TECHNICAL ANALYSIS PROBLEM IN TEACHING COMBUSTION ENGINE AND AUTOMOBILE.

2.2.1. Designing the technical structural analysis problem

In teaching combustion engine and automobile, there is the need to explain about the structure of mechanism, systems, components, or equipment. These issues are the foundation to design the TAP. However, in order to transform these issues to problems, the teacher needs to pedagogically

mechanizes, or in other words, designs the problem. The thesis presents two examples of designing the technical structural analysis problem (TSAP) in accord with the procedure in figure 1.2.

2.2.2. Designing the technical processing analysis problem

The procedure of constructing the technical processing analysis problem (TPAP) is shown in figure 1.3.

2.2.3. Some technical analysis problems

According to the procedure of designing the TSAP shown in chapter I (Figures 1.2 and 1.3), the curriculums of technical universities, and the document specializing on combustion engine and automobile, the author has constructed seventeen TSAPs and eight TPAPs.

2.3. EMPLOYING THE TECHNICAL ANALYSIS PROBLEM IN TEACHING THE COMBUSTION ENGINE AND AUTOMOBILE SUBJECT.

2.3.1. Building the solution and instructing students to solve the problem.

In order to applying the TAP in teaching, first of all, teachers need to identify the “answer” for the problem, which means creating the solution for that problem. This part presents examples showing the solution and the instruction for solving of four problems including two TSAPs and two TPAPs. The solution and instruction for the rest problems are shown in the appendix.

2.3.2. Employing the technical analysis problem in teaching

It is important to employ the TAP, and it mostly depends on the skill of teachers. This part presents two examples of using the TAP in teaching.

2.3.3. The employment of the technical analysis problem in evaluation

Similar to whatsoever problems applying for evaluation, the TAP using for evaluation must fulfill some requirements to maximize its effectiveness. This bullet highlights some points in assessing and evaluating, especially, the employment of the TAP to assess the learners’ technical thought.

Summary of chapter 2

Through studying the curriculums, characteristics, conditions, and contents of the combustion engine and automobile subject, the procedure of designing and employing the TAP has been established. Followings are few comments:

1. In teaching the subject combustion engine and automobile, there are various problems to develop into the TAP to employ in teaching to promote technical thought and enhance teaching quality.

2. The constructed problems, even in preliminary stage, allow confirming that the designing procedure proposed by the thesis in chapter I is correct and proper.

3. The constructed problems have met the pedagogical requirement, thus, can be used in teaching the combustion engine and automobile subject for technological pedagogical students. Additionally, the procedure can be applied in teaching other technical subjects.

4. The construction and employment of the TAP requires teachers' effort to improve specialized skills and capability. They should invest time and energy to construct proper problems and devise effective their applications.

5. The application of the TAP in teaching the combustion engine and automobile subject will inspire learners, develop their creativity and independent thoughts, and stimulate the flexible use of knowledge, thus, strengthening learners' knowledge and developing their technical thought.

Chapter 3
ASSESSMENT AND EVALUATION

3.3. THE PURPOSE, OBJECT, AND METHOD OF ASSESSMENT.

3.1.1. The purpose of assessment

Doing the assessment to validate the correctness of the thesis' proposed scientific hypothesis: Designing and employing the TAP in teaching the combustion engine and automobile subject for technical pedagogical students will develop their technical thoughts, thus, enhancing the quality and effectiveness of teaching.

Assessing also evaluates the correctness and feasibility of the procedure of constructing and employing the TAP proposed by the thesis. The assessment evaluates the quality, feasibility, and effectiveness of the TAPs built by the thesis and the curriculums containing these TAPs. It also measures the feasibility and effectiveness of the methodology measuring the learners' developing degree of technical thought.

3.1.2. The assessment's object

- In the specialized method, the thesis references seventy-seven professors lecturing the combustion engine and automobile in notorious technical training facilities such as, Ha Noi Polytechnic University, Ho Chi Minh City University of Technology and Education, Hung Yen University of Technology and Education, Military Technological Academy, etc. They are the experts in studying and teaching the combustion engine and automobile subject.

- With the pedagogical practical method, due to the limitation of students studying the combustion engine and automobile subject, plus, the author could only conduct the experiment at Hung Yen University of Technology and Education with 150 students in control class and 165 students in experimental class.

3.1.3. The assessment's method

In order to evaluate the correctness of the thesis' scientific hypothesis, the author applies two testing models, which are specialized and pedagogical experimental methods. The thesis also employs the mathematical statistics method to calculate the outcome.

3.2. ASSESSMENT BY THE SPECIALIZED METHOD

3.2.1 The content and process of the assessment

Conducting the specialized method through referendum and questionnaires

- In the referendum method, the author hosted some seminars at the department of teaching method, technological pedagogical faculty, Ha Noi University of Education. Although the number of seminars is not numerous, the author has received so many constructive feedbacks and comments about the research, its practical and theoretical basis, as well as its proposal.

- The author uses the questionnaires to ask for comments, feedbacks, and recommendations of the experts in building and employing the TAP for teaching the combustion engine and automobile subject.

3.2.2. The result of experiment

a) Qualitative evaluation

Through synthesizing information from seminars and expert feedbacks, there are following perceptions:

- The procedure of building the TAP insures the science and feasibility. However, the teachers must invest time and effort; the execution must be serious, active, and flexible.

- The edited TAPs comply with the content and curriculum of the combustion engine and automobile subject.

- The procedure of employing the TAP is inclusive and suitable for various objects (colleague and university students)

- The employment of the TAP would inspire students. These TAPs are good devices to improve learners' technical thought.

b) Quantitative evaluation

This table presents the feedbacks from seventy-seven experts, detailed in tables 3.2, 3.3, and 3.4.

Table 3.2 Evaluating the procedure of constructing, employing and quality of the problem

The fields of assessment	**Results**			
	Very good	Good	Acceptable	Need imrovement
I. The procedure of building the problem				
1. General assessment on the procedure of constructing the TSAP	57	19	1	
2. General assessment on the procedure of constructing the TPAP	51	25	1	
3. Assessing the logic of steps in the procedure	50	26	1	
4. Assessing the applicability of the procedure	41	34	2	
5. Assessing the feasibility of the procedure in constructing the problem for other technical subjects	48	23	6	
II. The procedure of employing the problem				
1. General assessment on the procedure of employing the problem	50	23	4	
2. Assessing the logic of steps in the procedure	50	25	2	
3. Assessing the applicability of the procedure	48	28	1	
4. Assessing the feasibility of the	43	30	4	

procedure in constructing the problem for other technical subjects				
3. The quality of constructed problems				
1. The precision in science and technology	42	34	1	
2. The correctness and intelligibility in presentation	37	35	5	
3. the feasibility of the problem in teaching	49	27	1	
4. The attractiveness of the problem	46	25	6	
5. The effect of the problem in improving the teaching quality	54	18	5	
IV. The quality and role of the TAP				
1. The suitability of the constructed TAP to the combustion engine and automobile subject	50	26	1	
2. The usage of the problem develops learners technical thought	56	21		
3. The usage of the problem does not delay the progress of the subject	34	40	3	
4. The problem helps broadening knowledge and improving the skill of solving problems	51	24	2	
5. The problem is feasible and suitable	40	37		
6. The problem inspires learners	54	21	1	
7. The problem increases the activeness in students	61	16		

Comments on the twenty-five constructed TAPs

Table 3.3 Comments on the twenty-five constructed problems

Problem	**Comments**			
	Applicable	Need to improve the presentation	Need to be improved and modified	Other thoughts (*)
Problem 1	38	16	2	21
Problem 2	44	3	4	26
Problem 3	49	3	1	24
Problem 4	41	12	1	23
Problem 5	42	9	0	26
Problem 6	44	10	2	21
Problem 7	49	4	0	24
Problem 8	49	3	0	25
Problem 9	49	3	0	25
Problem 10	48	5	0	24
Problem 11	49	1	6	27
Problem 12	45	10	1	21
Problem 13	51		0	26
Problem 14	50	1	0	26
Problem 15	40	13	1	23
Problem 16	46	3	0	28
Problem 17	38	4	10	25
Problem 18	46	3	0	28
Problem 19	48	1	0	28
Problem 20	31	8	1	37
Problem 21	44	2	0	31
Problem 22	38	10	8	21
Problem 23	40	6	9	22
Problem 24	43	3	0	31
Problem 25	52	1	0	24

(*) Other thoughts: experts' feedbacks specifically recommend and suggest points to complete the problem's content.

Basing on the questionnaires and feedbacks of the experts, there are some conclusions:

- The procedure of building, solving, and using the TAP for the combustion engine and automobile subject ensures the science and applicability.

- In general, the constructed TAPs meet the standard of the cognitive problem; thus, can be used for the stages of teaching process. The application of the problem would inspire students as well as improve their technical thought.

- The procedures of constructing and employing the TAP can be applied for teaching other subjects of technical training.

Thanks to experts' feedback, the author has completed procedures and employed constructed problems.

3.3. ASSESSMENT BY THE PEDAGOGICAL EXPERIMENTAL METHOD

3.3.1. The content and process of the experiment

The experiment was conducted at two classes of Hung Yen University of Technology and Education. The experimental and control classes have quite similar curriculums and assessments in terms of contents, the numbers of test, and the scale of score.

- The students in both control and experimental classes are equal in terms of intellectual capability as well as studying results.

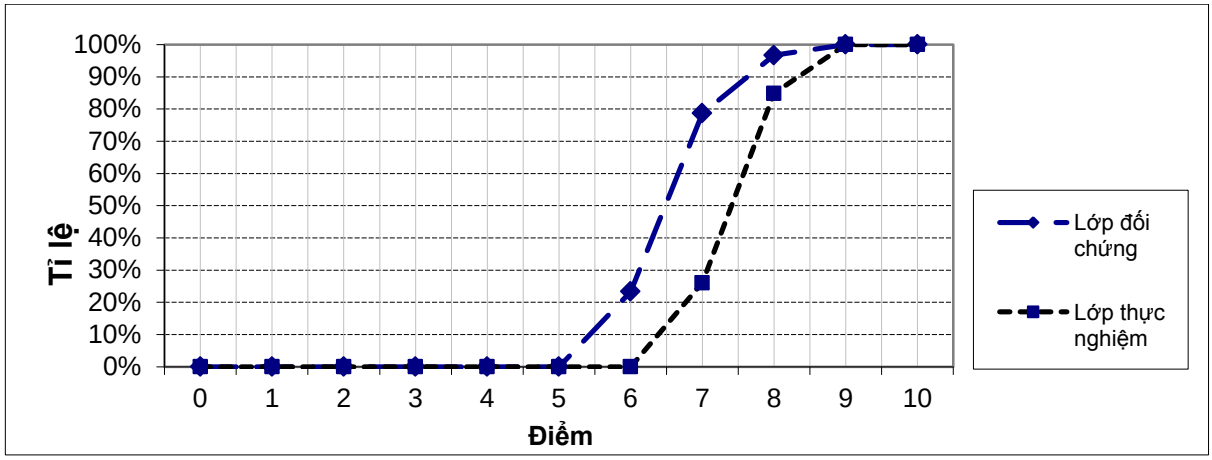

Chart 3.2 the frequency graph of students getting X_i (The first test)

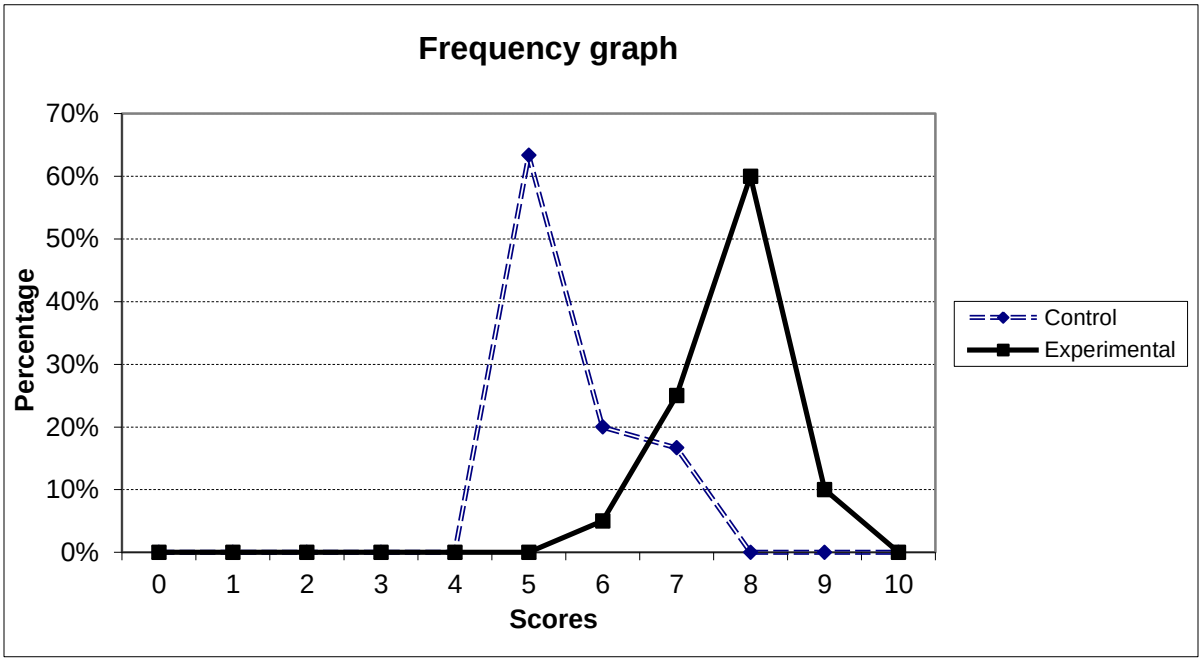

Chart 3.4 the frequency graph of students getting X_i (The second test)

While the control class remains the traditional teaching method, the experimental class applies the method containing constructed TAP problems. The two classes were then assessed by two tests, a midterm and an end of course surveys. The result of the second test was processed by statistics method and shown in figures 3.2 (the first test), figure 3.4 (the second test), and figure 3.5 showing both tests.

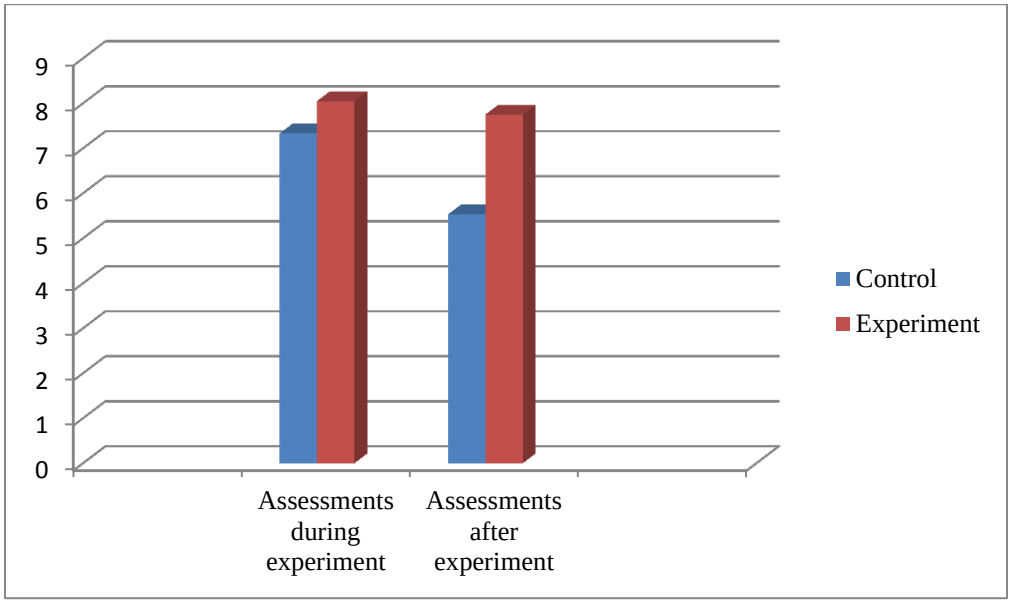

Chart 3.5 the bar chart comparing ($\overline{X}$) of the two tests during the experiment

Summary of chapter 3

There are some conclusions basing on the conducted experiment and evaluation.

1. The application of the TAP in teaching the combustion engine and automobile for technological pedagogical students is a new way in renewing the teaching method and an improvement of teaching quality and effectiveness.

2. The experiment indicates the employment the TAP in teaching combustion engine and automobile is suitable, feasible, and effective. It inspires learners, develops their technical thoughts, thus, enhancing the quality of teaching the combustion engine and automobile subject.

3. The experiment also shows that teachers should invest time and effort in analyzing the curriculums to employ the TAP in an effective way. They also need to cultivate pedagogical skills and knowledge to use the TAP in a proper way.

4. The experiment, especially the specialized one, indicates: the procedure of designing and employing problems. the problems' contents and solutions, and the instruction of employing the TAP in teaching the combustion engine and automobile is correct, suitable, and feasible.

CONCLUSION AND RECOMMENDATION

1. Conclusion

The studying the theory of technical problems and cognitive problems indicates the application of the TAP in teaching the combustion engine and automobile subject is highly effective and feasible. The TAP is not always about the available problems in curriculums; therefore, the teacher needs to research and look for proper issues to build the problem. The construction of the problem must base on the content, target, and task of the subject, or the issue incurred from the reality. With the purpose of building and employing the TAP in teaching to improve learners' technical thought and skills, thus, improving the teaching quality, the research project *"The technical analysis problem and its employment in teaching the combustion engine and automobile for technical pedagogical students"* has succeeded in solving the following tasks:

1. Basing on the theoretical basis of technical problems, the thesis has constructed the concept system of the TAP. Particularly, it has built the concept, structure, and characteristics of the TAP; established the procedure of designing and employing the TAP in teaching; proposed solutions and determined the criteria assessing the development level of learner's technical thought by using the TAP.

2. The project has studied, surveyed, and assessed the reality of teaching the combustion engine and automobile in terms of designing and employing the TAP. The survey is the practical basis to establish and design the procedure of employing the TAP for pedagogical students.

3. Applying the proposed proceduresand basing on the reality of teaching the combustion engine and automobile subject, the thesis has established the system of TAPs that can be applied in teaching the combustion engine and automobile for technical pedagogical students.

4. The science, feasibility, and effectiveness of the procedures has been

assessed and evaluated by pedagogical experimental and specialized methods. The result of the experiment proves the effect of the TAP in developing learners' technical thought and improving teaching quality.

5. The constructed problems not only apply for teaching the combustion engine and automobile but also assisting teachers in other technical subjects.

2. Recommendation

The author proposes several solutions to enhance the teaching quality as follow:

1. Teachers can modify and supplement the constructed TAPs to fit the certain teaching conditions.

2. It should conduct research on this subject to complete the system of TAPs to serve the process of teaching the combustion engine and automobile in a most effective way.

3. During theoretical and practical lessons, teachers should increase constructing and employing the TAP to improve students' technical thought and skill.

4. It should conduct more research to complete the theoretical system of the TAP, so it can be applied to other technical subjects in other technical training facilities. During the implementation, the procedures can be modified to optimize the content of the project.

LIST OF PUBLICATIONS

1. Nguyen Trong Khanh, Nguyen Thi Thanh Huyen (2012), *The application of schematization in teaching "the application of internal combustion engine subject"*, Journal of Science 9 – 2012 (November/2012) / Hanoi National University of Education, ISSN-0868-3719, pp. 104-110.
2. Nguyen Thi Thanh Huyen (2013), *Developing technical thought for students through the technical analysis problem,* Scientific report, Summary of HNUE Youth Scientific Conference no. VI-2013 May 2013, pp. 39-40.
3. Nguyen Thi Thanh Huyen (2013), *The technical analysis problem and its employment in teaching Combustion Engine and Automobile*, Educational Journal, Special Issue April 2013, pp. 109 – 110.
4. Nguyen Thị Thanh Huyen (2013), *The application of conventional signs in teaching in vocational subjects.*, Educational Journal, Special Issue July 2013, pp.110.
5. Nguyen Thi Thanh Huyen (2017), *Assessing the developing level of students' technical thought through the employment of the technical analysis problem*, Educational Journal, Octocber 2017, pp. 31-34.