MINISTRY OF EDUCATION & TRAINING

HANOI NATIONAL UNIVERSITY OF EDUCATION

NGUYEN THI HUONG GIANG

ONLINE INSTRUCTIONAL TECHNOLOGY BASED ON LEARNING STYLES

***Speciality*: Theory and Method of Teaching**

the Industrial Technique Subject

Classification: 62.14.01.11

PhD THESIS SUMMARY ON EDUCATION SCIENCE

Hanoi- 2016

The research works were completed at: Department of Teaching Methods, Faculty of Technology Education, Hanoi University of Education

Scientific Supervisor:

Prof.Dr. NGUYEN XUAN LAC

Reviewer 1: Assoc. Prof. Dr. Nguyen Van Khai – ThaiNguyen University of Education

Reviewer 2: Assoc. Prof. Dr. Ta Tri Phuong – Hanoi Pedagogical University No2

Reviewer 3: Dr. Vu Thi Lan – Hanoi University of Science and Technology

The thesis is going to presented to the thesis defense committe at Hanoi University of Education

at……date…….

The original copy of this thesis can be found at: The National Library, the Hanoi Library; The Library of HNUE.

INTRODUCTION

1. BACKGROUND OF THE THESIS

Online learning is changing the way people deliver and obtain knowledge. Based on the advances of computer and communications technology, online learning offers a uniform learning environment in which the courses can be accessed from anyone, at any time, and in anywhere. Nowadays, Vietnam has the infrastructure in place to enable considerable implementation of online learning in education and training. This is a big advantage for many universities and colleges using online learning to implement distance learning in Vietnam. Therefore, researches on online learning are important for Vietnamese universities and colleges to extend types of training and increase the quality of qualification. However, at present, applying online learning in Vietnamese education and training is broad but not profound; courses on e-learning mainly supply same knowledge for all students. Therefore, the proposal of the thesis is study about "*Online Instructional Technology Based on Learning Styles*".

2. OBJECTIVES OF THE RESEARCH

Proposing the online instructional technology, then developing the online learning environment based on learner's styles.

3. TASKS OF THE RESEARCH

- Study on the theory of Online Instructional Technology based on the Learning Styles.
- Evaluate the state of the online learning and learner's styles.

- Propose the online learning enviroments adaptive to learners' styles.
- Apply these proposes into the certain online learning period, then test and evaluate.

4. OBJECTS - SUBJECTS – SCOPE OF THE RESEARCH

Objects of the research

Online teaching process of technical subjects for adult learners.

Subjects of the research

How to design the online learning environment based on the typical learner's styles.

Scope of the research

Implementing and testing the online courses for 4 learners' styles according to Learning Orientation Model (LOM) in topic "Assembling the circuit for experiment on operating principle of AND logic gates", lesson "The basic logic gates", subject "Digital Electronics", curriculum "Industry Electronics".

5. SCIENTIFIC HYPOTHESIS

Learning styles are related to learning activities in the online learning environments, this is a fundamental for designing the online learning according to learning styles, partly increase the quality of online courses.

6. RESEARCH METHODS

Theoretical research method

Practical research method

7. CONTRIBUTION OF THE RESEARCH

Proposing the theory and technology of online learning such as the concept of online instructional technology, the basic features of online instructional technology, the structure of online lessons and how to design an online lesson according to technology approach.

Proposing and developing the online enviroments adaptive to learners' styles.

Initially proving that there is a relation between learning styles and learning activities in online courses, then this proposal will set up a pedagogical platform for building a software tool to classifying online students in an adaptive learning management system (ALMS).

8. ORGANIZATION OF THE THESIS, including 3 parts:

Part 1: Introduction

Part 2: Content, consists of 3 chapters:

Chapter 1: Theory of Online Instructional Technology according to Learning Styles

Chapter 2: Practical Fundamentals for Designing the Online Learning Environment oriented to Learning Styles

Chapter 3: Testing – Evaluating

Part 3: Conclusion and Recommendation

CHAPTER 1. THEORY OF ONLINE INSTRUCTIONAL TECHNOLOGY ACCORDING TO LEARNING STYLES

1.1 Introduction

Online learning strongly attracted investors from all over the world in the late 1990s to the present, creating new expectations about a revolution in the technology sector and the education sector, opens a new demand for technology training in Vietnam.

1.2 Literature review in the world

Currently, the online learning market has a new landmark development, requires developing the intelligent solutions integrated in online courses. Therefore, proposing the online environments adapted to learning styles will improve the capability of learning personalization in online learning.

1.3 Literature review in Vietnam

The Vietnamese Educational Policies support for application ICT in teaching and learning. Moreover, it takes a lot of advantages for building online courses in Vietnam because of the development of Internet infrastructure. Therefore, in Vietnam there are many doctoral thesis that research on this field: the online courses do not attract the learners. This is really a big challenge for the deployment of online courses.

To improve the attraction of online course, the thesis focuses on the pedagogy aspects of developing online courses, such as:

- Studying the online teaching process according to the technology approach: theoretical perspectives of online instructional technology; steps of designing online lessons and

the effectiveness of online courses designed according to technology approach.

- Proposing the design of the adaptive learning environment in online courses, such as: models of learning styles; evaluating the styles of HUST's students; developing the online environments according to LOM.
- Testing and evaluation during the process of implementing some courses designed according to the proposals of thesis.

1.4. Key concepts

1.4.1. Online Instructional Technology

1.4.1.1. The concept of "Online learning"

Online learning (or online learning and teaching) is the instructional form that integrates ICT applications to deliver lessons to learners via the Internet.

1.4.1.2. The concept of "Online Instructional Technology"

Online instructional technology is a system of online instructional means, methods and skills making use of psychological, sociological,…, objective laws to educate and train online the learners so that they achieve the necessary qualifications (including working knowledge, skills and behaviour) in order to meet the employment needs of the society.

1.4.2. Three basic elements of online instructional technology

1.4.2.1. Online learning means

Consist of: means for orientating actions, *visual means and symbol means. They are:*

- Multimedia
- Virtual and parametric interactivity
- Realtime interactivity online
- Reusable: accessible, capacity and quality

1.4.2.2. Online learning methods

Online learning methods are rules for application of online teaching's theory into designing multimedia; using multimedia and internet services; building pedagogical strategies to organize an online course for deliver learning contents.

1.4.2.3. Online learning skills

Skills to apply effectively the theory, means and methods into online learning.

- *basic informatics skills*
- *skills for using and designing modern teaching means, Internet services.*
- *behavior skills of "self-guided learning".*

1.4.3. Learning styles

Learning styles are the prefered and stable characteristics of learners that specify how to receive, process, store and respond information to gain knowledge in learning environment.

1.4.4. Online learning environment oriented to learning styles

Online learning environment oriented to learning styles is defined as the learning environment is designed and developed

in the way that the presentations of learning contents according to learners' styles.

1.5. Learning and teaching in online courses

1.5.1. The learning process

- The heritage of traditional learning:

+ Learners must have motivation.

+ Learners take part actively in whole of learning process.

+ Learners commit their responsibility in learning process.

- Remote learning

+ Self-learn at high level and self-learn with instructions

+ Individual learning → Personalized learning

- Learning in modern environment.

1.5.2. The teaching process

- The pedagogical strategies of interests
- The pedagogical strategies of success

+ teaching means and methods

+ assessment and measurement

- The peadagogical strategies of interaction:

The learning activitites in relations of Teacher – Learner – Environment.

1.5.3. Organization in online learning (figure 1.9)

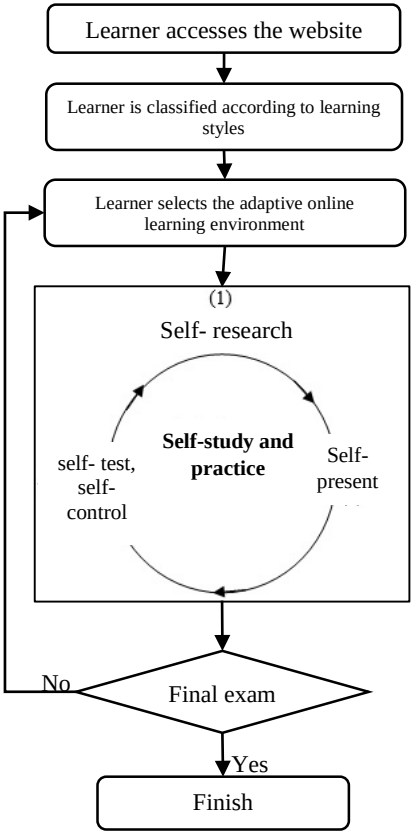

Fig. 1.9. Procedure of learning organization in online learning

1.5.4. Developing the adaptive online learning environment

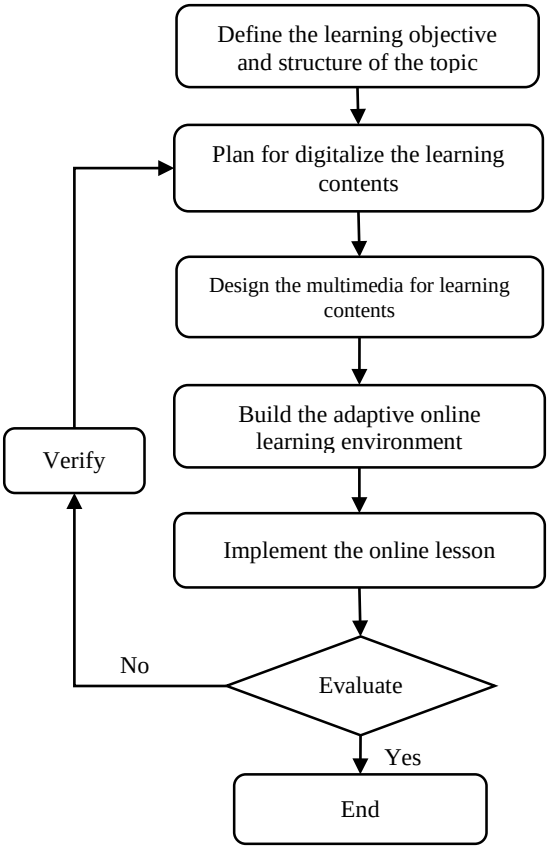

Fig. 1.10. Procedures of developing the adaptive online learning environment

1.6. Learning Styles Model

1.6.1. Models of learning styles

There are many different models of classifying learners, so it is very necessary to assess the contribution of the model for individualize learning in online courses. This helps to find out

the most suitable model with the requirements of current online training. The basic of this assessment is the properties of classifying learners in online course. These properties are drawn from analyzing: the necessary skills of online learners; the fundamentals of classification; and the capability of supporting the automatic classification.

1.6.2. Learning Orientation Model- LOM

In recent researches on classification of learners in online courses, many approaches on how to control the individual learning differences between learner groups are introduced. Then, there are a lot of classification models that are proposed as mentioned above. Based on the assessment of these models for identifying online learners according to the above criteria, the most suitable model is the model of Margaret Martinez on learning orientation (LOM).

LOM describes four learning orientations based three important aspects of online learners: (1) emotional/intentional motivational aspects, (2) self-directed strategic planning and committed learning effort, (3) learning autonomy.

This model classifies learners into 4 groups: Innovator, Implementer, Reproducer and Resister.

CHAPTER 2. PRACTICAL BASIS FOR DESIGNING THE ONLINE LEARNING ENVIRONMENT ORIENTED TO LEARNING STYLES

2.1. Fundamentals of designing the online learning environment oriented to learning styles

2.1.1 Evaluation on online courses in Vietnam

Learners access online lessons by using three typical types: tutorial websites shared freely (28.7%), tutorial videos shared freely (26.4%) and tutorial websites integrated videos (23.8%). In contrast, there is a small number of learners in other types, such as courses included websites and videos are shared freely (11.4%) and commercial courses (8.7%).

The most favourite type is the courses included websites and videos that shared freely (35.2%); the lower favourite one is the commercial courses (24.4%). Although tutorial websites are widely used but there are less learners prefer (21.6%) and the lowest favourite is tutorial videos (18.8%).

The rate of students who have the best effort to finish the course is low (14.8%). Nearly a third of respondents (33.6%) sometimes study in an online course. The percentage of students studying some lessons and dropping out immediately is about 19%. Therefore, the online courses do not attract the learners. This is really a big challenge for the deployment of online courses.

2.1.2. Investigating the learner's styles according to LOM

- Objectives: Identifying the learning characteristics of each learner's group according to LOM.
- Objects of the survey: Students at Hanoi University of Science and Technology (HUST).

Table 2.7. Code value for learning style

Learning Style	**Code value**
Innovator	1
Implementer	2
Reproducers	3
Resister	4

Table 2.8.Mean of learning styles

TT	Learning situation	Mean_learning styles	
		Mean	**Std. Deviation**
1	Passion	**2.03**	**0.69**
2	Motivation	**1.82**	**0.66**
3	Setting the goals	**1.80**	**0.99**
4	Type of tasks	**1.68**	**0.92**
5	Solving a problem	**2.03**	**0.95**
6	Making the effort	**2.04**	**0.85**
7	Self-manage	**1.63**	**0.73**
8	Affection of environment	**2.45**	**1.04**
9	Dependence on environment	**1.79**	**0.84**
10	Favourite environment	**1.87**	**0.87**
	Average Mean	**1.91**	**0.85**

Code value:Innovator:1, Implementer: 2, Reproducers: 3, Resisters: 4

Table 2.19. The frequency (%) of learning styles

Valid Percent	**Innovators**	**Implementers**	**Reproducers**	**Resisters**
Passion	**19**	**61.3**	**16.2**	**3.6**
Motivation	**29.5**	**61.8**	**5.4**	**3.3**
Setting the goals	**47.9**	**33.6**	**6.7**	**11.8**
Type of tasks	**58.7**	**25.5**	**9.7**	**6.2**
Solving a problem	**37.3**	**29.4**	**28.1**	**5.1**
Making the effort	**25.3**	**51.2**	**15.3**	**8.2**

Self-manage	**48.1**	**43.7**	**4.6**	**3.6**
Affection of environment	**17.3**	**41.9**	**17.0**	**23.8**
Dependence on environment	**42.9**	**42.1**	**9.5**	**5.5**
Favourite environment	**38.6**	**40.4**	**15.5**	**5.5**
Average Percentage	**36.46**	**43.09**	**12.8**	**7.66**

2.2. Design of Online Learning Environment Oriented to Learning Styles

2.2.1. Organization the adaptive learning environments according to LOM

Table 2.20. Types of learning environments suitable for learner's style respectively

	Learning styles	Types of learning environments
Innovators	Strong passions and intentions on learning Set long-term challenging goals Commits great effort to study Responsibility and self-management	Research-based Learning Environment
Implementers	Focuses emotions/intentions on learning selectively or situationally Set short-term, task-oriented goals Commits measured effort Prefers coaching and interaction for achieving goals.	Collaborative Learning Environment

Reproducers	Focuses intentions and emotions cautiously and routinely as directed. Follows and tries to achieve simple task-oriented goals assigned and guided by others. Wants continual guidance, and expects reinforcement	Guided-structured Learning Environment.
Resisters	Focuses on not cooperating. Efforts to resist assigned or expected goals Avoids learning (apathetic, frustrated, unable, discouraged, or disobedient)	Research-based Learning Environment

2.2.2. Research-based Learning Environment

Research-based Learning Environment is organized as a small invidual project.

2.2.2.1. Online Instructional Technology

- Online Learning Means: Webquest.
- Online Learning Methods*:* Project based Training.
- Online Learning Skills*: Self-learn Guidance*

2.2.2.2. Learning Organization

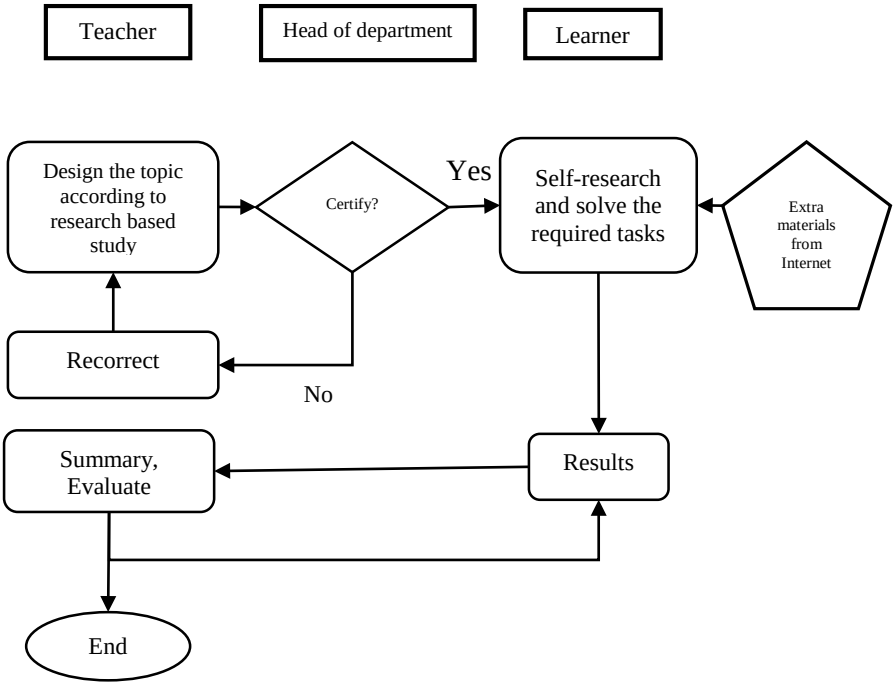

Fig. 2.2 Learning organization in the self-research online learning environment

2.2.2.3. Application

2.2.3. Collaborative Learning Environment

Collaborative Learning Environment is organized as an internet based seminar.

2.2.3.1. Online Instructional Technology

- Online Learning Means*: Social networks such as:* Facebook, Forum or Wiki
- Online Learning Methods*: Case-study*
- Online Learning Skills*:* Collaborative

2.2.3.2. Learning Organization (Fig 2.4)

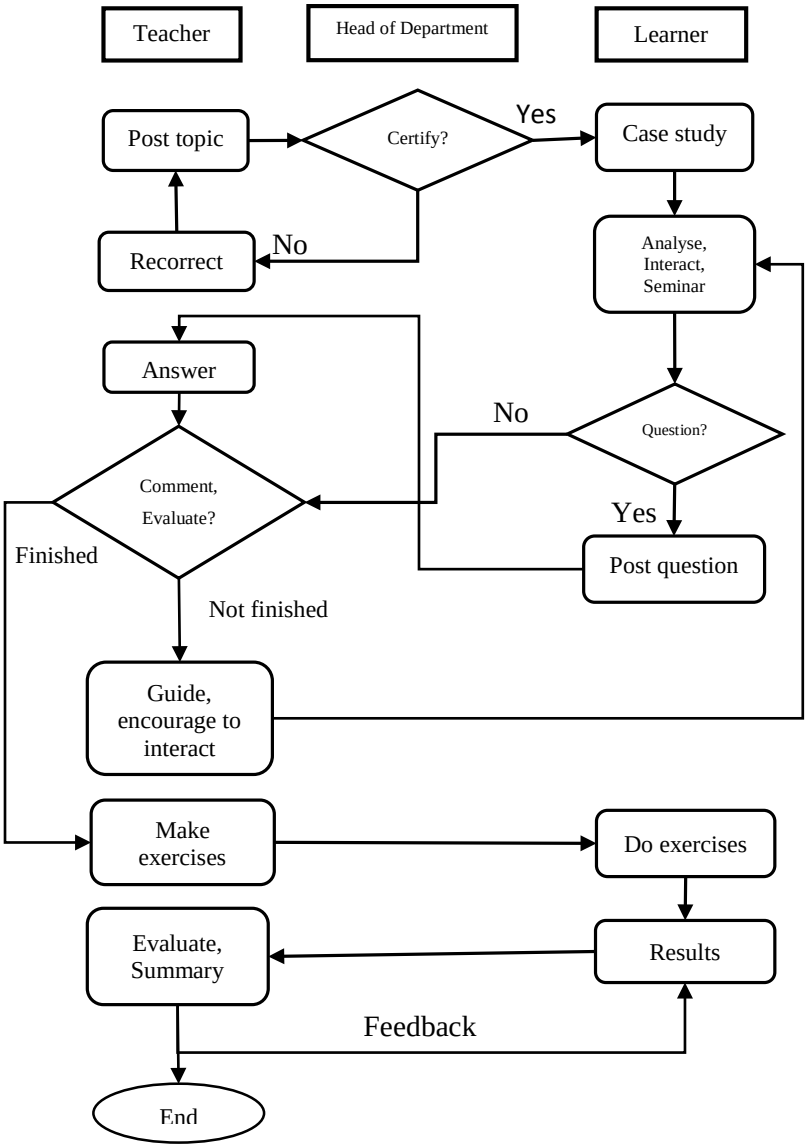

Fig 2.4. Learning organization in the collaborative online learning environment

2.2.4. Guided-structured Learning Environment.

Guided-structured Learning Environment is organized as linear structure with fully-guided tasks.

2.2.4.1. Online Instructional Technology

- *Online Learning* Means*: Multimedia lessons (in SCORM format)*
- *Online Learning* Methods*:* method of deductive-expository that presents general information and then presents some examples.
- Online Learning Skills*: skills of designing multimedia*

2.2.4.2. Learning Organization (fig 2.5)

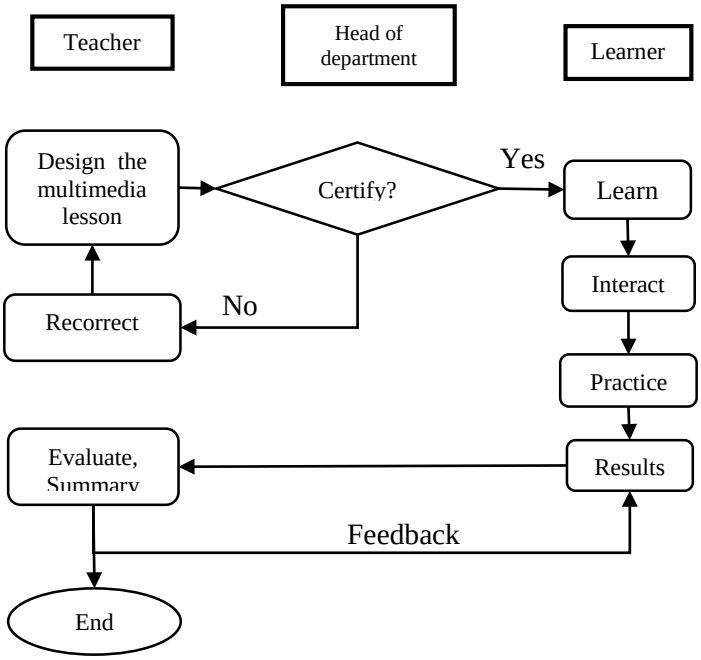

Fig 2.5. Learning organization in the guided-structured online learning environment

2.3. Controlling the online learning activities according to learning styles (fig 2.7)

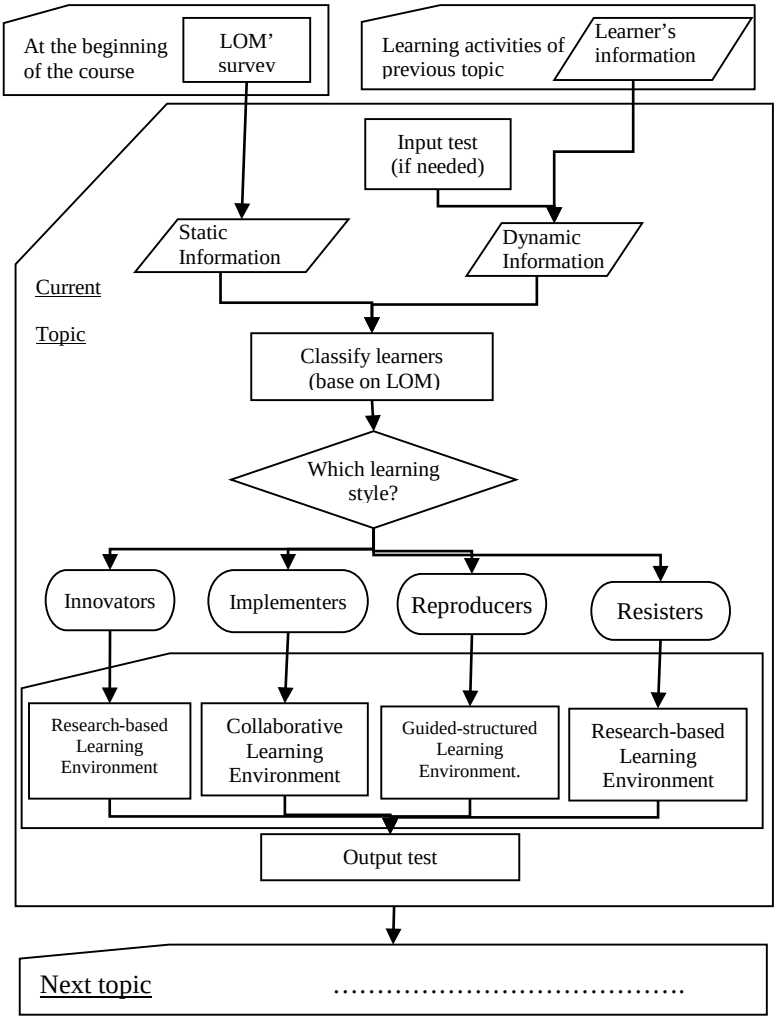

Fig 2.7. Routine the learning activities in the adaptive online learning environment

2.4. Organization of the adaptive online environment for the topics "Assembling the circuit for experiment on operating principle of AND logic gates"

Organization the learning activities in the adaptive online environment includes the following steps:

- *Access the website to study*
- *Identify the learner' style*
- *Choose the suitable environment according to teacher's recommendation*
- *Practice via online chat room*
- *Evaluate the learning results*

CHAPTER 3. TEST-EVALUATION

3.1. Purpose and content of test and evaluation

3.1.1. Purpose

Implementing the solutions of building an online learning orientation environment according to technology approach in teaching the Subject of Digital Electronics, after that *assessing* the feasibility and effectiveness of the proposal and then *affirming* the hypothesis pointed out in the introduction part of the thesis.

3.1.2. Content

Evaluating the feasibility and effectiveness of online teaching process in the adaptive learning environments, proving that there is a relation between the learning styles and the learning activities in online environments, then learner will be motivated to study if the online learning environment designed according to his learning style.

3.2. Methods of test and evaluation

- Expert method
- Experimetal teaching method

3.3. Processing and analysing results of test and evaluation

3.3.1. Evaluation results of the expert method

Collecting the opinions of 16 educational experts by sending the polls enclosed with the experimental content brief. The results show that there are above 90% consulted experts who are agree with the proposals. Based on the comments and evaluation results of the experts, the thesis adjusts the concepts, technological features, teaching strategies in each proposed learning environment before deploying the experimental teaching.

3.3.2 Evaluation results of the experimental teaching method

Using Chi-square Test and (one way) ANOVA analysis to affirm the appropriate of the thesis hypothesis.

3.3.2.1. Experiments on the Group of Innovators

- Chi-square Test

Table 3. 1. Relations between the Innovators and learning activities in online courses

Innovators	**Chi-square**			**Correlation**
	Value	Critical value	Appropriate value	
Interact	18.142	7.88	99.5%	-0.621
Learn	7.303	5.99	95%	-0.384
Practice	10.493	9.21	99%	-0.472

- One way ANOVA analysis

Table 3. 2. The results of ANOVA analyzing on learning motivation of Innovators

ANOVA

Do you like the course

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6.119	2	3.060	21.401	**.000**
Within Groups	2.431	17	.143		
Total	8.550	19			

ANOVA analyzing learning motivation of Innovators in three different learning environments has the level of observed sig. = .000<0.05. This means that there is a statistical significant learning motivation variance of Innovators in three different learning environments. The learners have the highest motivation (2.6667) when they study in the Research-based Learning Environment, have the lower motivation (1.1250) in the Collaborative Learning Environment and have the lowest motivation (1.1111) in the Guided-structured Learning Environment.

3.3.2.1. Experiments on the Group of Implementers

- Chi-square Test

Table 3. 3. Relations between the Implementers and learning activities in online courses

Implementers	**Chi-square**			**Correlation**
	Value	Critical value	Appropriate value	
Interact	8.081	7.88	99.5%	0.415
Learn	5.189	4.61	90%	0.260
Practice	8.469	7.38	97.5%	0.420

- One way ANOVA analysis

Table 3. 27. The results of ANOVA analyzing on learning motivation of Implementers

ANOVA

Do you like the course

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6.521	2	3.260	9.597	**.003**
Within Groups	4.417	13	.340		
Total	10.938	15			

ANOVA analyzing learning motivation of Implementers in three different learning environments has the level of observed sig. = .003<0.05. This means that there is a statistical significant learning motivation variance of Implementers in three different learning environments. The learners have the highest motivation

(2.8333) when they study in the Collaborative Learning Environment, have the lower motivation (1.8333) in the Research-based Learning Environment and have the lowest motivation (1.2500) in the Guided-structured Learning Environment.

CONCLUSION AND RECOMMENDATION

1. Conclusion

Teaching online is a form of teaching applications of ICT achievements, giving a flexibility of geography, time and personalized ability in learning process. Through researches in the world and Vietnam, the initial contribution of online learning is assessed positively as possible to help participants reach the social learning, enhance lifelong learning opportunities; help students quickly access and update with society through the tools and modern media; create a positive learning environment, promoting an active role of the learner. However, online learning implementation still faces many difficulties as in perception because the habit of both teachers and learners become accustomed to the face to face learning environment; some teaching content can not teach pure by online learning; and especially the barriers of authentication in online courses, evaluation of online learning, pedagogy of online courses has not been sufficient attention ...

The thesis proposed the theoretical and practical perspectives of online instructional technology such as the concepts of online instructional technology, online teaching means, online teaching

methods, online teaching skills and how to design an online lesson according to technology approach.

Building successful the adaptive online environment, the learner will be routed corresponding to each topic, and experience in various learning environments during the learning process. Therefore, depending on the learner's ability in each subject, he will be recommended to study in a suitable environment. Such as, the Collaborative Learning Environment is designed for the Implementers, the Research-based Learning Environment is designed for Innovators and the Guided-structured Learning Environment is designed for Reproducers.

The results of the experimental testing affirm the appropriate of the thesis hypothesis.

2. Recommendation

Online learning is the trend of learning in the 21st century. However, to deploy effectively online learning in Vietnam, the training institutions should have plans for fostering awareness, preparing the conditions of work, developing the designed skills as well as learning management skills so that teachers and students be able to approach easily to the online learning.

Combining synchronous the technological requirements and the pedagogical requirements in designing an online course.

To success in online teaching, it is necessary to invest in researching and developing the solutions of simulations, especially in online simulations.

LIST OF PUBLISHED RESEARCH

[1] Nguyen Thi Huong Giang, Nguyen Thi Viet Huong, *Proposal of building adaptive learning management system in Vietnamese online courses*, Journal of Science and Technology, HUST, Vol. 75(2010). pp. 156-160, ISSN 0868-3980.

[2]. Nguyen Thi Huong Giang, *Classification of learners in an Adaptive Learning Management System*, Journal of Sciences of HNUE, Interdisciplinary Science, 2013 Vol. 58, No.5, pp. 159-165, ISSN 0868-3719.

[3]. Nguyễn Thị Hương Giang, *Using and creating the online teaching means of technique practice skills*, Education Magazine (9/2013), MOET, pp.145-147. ISSN 21896 0866 7476.

[4]. Nguyen Thi Huong Giang, *Evaluation of Online Instructional Model for Teaching Hands-On Technical Skills*, International Engineering and Technical Education Conference, 11-2013, ISBN: 978-0-646-59658-7.

This paper was awarded by IETEC'13 for IJQAETE's special issue:

Nguyen Thi Huong Giang, *Implementation of Online Instructional Technology and Hands-On Skills Training*, International Journal of Quality Assurance in Engineering and Technology Education (IJQAETE), Volume 3, Issue 2, p.65-76 April - June 2014, Published: Quarterly in Print and Electronically, ISSN: 2155-496X; EISSN: 2155-4978; Published by IGI Global Publishing, Hershey, USA. http://www.igi-global.com/ijqaete

[5]. Nguyen Thi Huong Giang, *Simulation the hands-on manipulation by using visual quiz in CourseLab*, Educational Equipment Magazine, No.99 November-2013, pp.46-48. ISSN 1859-0810.

[6]. Nguyen Thi Huong Giang, *Online Instructional Technology according to learning orientation approach*, Educational Equipment Magazine, No.109 September -2014, pp.46-48. ISSN 1859-0810.

[7]. Nguyen Thi Huong Giang, *Solutions for orientation of learning in online environment*, Journal of Science, HNUE, ,Volume 60, Number 1/2015, pp.20-29. ISSN 2354-1075

[8]. Nguyen Thi Huong Giang, *Organization of online collaborative environment*, Educational Equipment Magazine, No.121 September -2015, pp.30-32,40. ISSN 1859-0810.

[9] Nguyen Thi Huong Giang, *Developing vocational competence in online learning*, Journal of Science, HNUE, Volume 60, Number 8D/2015, pp.115-123. ISSN 2354-1075