The development of Web-based Instruction model by using Knowledge Management Strategies on Educational Technology Subject for Higher Education Level

Rattakorn Kidkarn

Abstract

This research aimed to: 1) develop a Web-based Instruction model by using knowledge management strategies on educational technology subject for higher education level, 2) test an efficiency of the model, and 3) test an effectiveness of the model. The research methods comprised of three steps: 1) create a Web-based Instruction model, 2) a quality assessment of the Web-based Instruction model, and 3) the assessment of the effectiveness of the Web-based Instruction model with undergraduate students of education program at Nakhon Ratchasima Rajabhat University. The subjects were 30 of second year undergraduate students of education program at Nakhon Ratchasima Rajabhat University, by simple random Sampling. T-test dependent used for data analysis. The research results revealed that:

The Web-based Instruction model using knowledge management strategies called “DASSU model” includes 5 steps as follows: 1) dream draw (Defining: D), 2) find acquisition (Acquisition: A), 3) share knowledge created by me and you (Sharing: S), 4) keep in storage (Storage: S), 5) use when necessary (Utilization: U). The Web-based Instruction model by using knowledge management strategies on educational technology subject for higher education level comprised of 11 components: 1) goals, 2) objectives, 3) subject contents, 4) computer system and internet, 5) supportive factors, 6) a learning process, 7) web interaction, 8) learners, 9) instructors, 10) specialists, 11) an evaluation. The educational technology Web-based Instruction model by using knowledge management strategies has an efficiency of 87.13/86.25, which is corresponding with 85/85 provided criteria. The assessment of the effectiveness of the Web-based Instruction model was found that the post-test average scores in achievement of students were statistically significantly higher than pre-test scores at 0.01 level, and the post-test average scores on Self-directed Learning ability, were statistically significantly higher than pre-test scores at 0.01 level. Furthermore, the student’s opinions toward learning through the Web-based Instruction model was acceptable.

Introduction

Advances in technology are the cause of competitions in terms of economy, society, culture, and even education. The world at present is going to become a society of knowledge and learning, as many put it “Knowledge-based Society” which uses intellectual capital and knowledge to gain more advantages in the competitions. In order that a country becomes a society of good quality knowledge, the most important factor is quality human resource which reflects the importance of education and the demands of the changes as well as paradigm in the modern world. Higher education plays an important role in developing scholars so that such country can compete with others. According to Ministry of Education about the standards of higher education, the graduates at the higher education level must have knowledge and be skillful in their science. They must be able to learn, create and apply knowledge to develop themselves. They must be able to work and create work to develop their society so that it can compete with others in an international level (Ministry of Education, 2003). Self-directed Learning, therefore, is considered a kind of learning which should be cultivated in students at higher education level.

Self-directed Learning is a kind of learning in which learners are responsible for their plans, practice and evaluation of their learning progress. Learning in this way can be done in every learning situation because learners can transfer what they learnt and skills they acquired from one situation to another with meaning (Hiemstra, 1993). Dixon (1992: 2) states that Self-directed Learning is a process where learners analyze their learning needs, set their goals of learning, seek knowledge, provide learning resources as well as evaluate their own learning. These steps are important for life-long learning. This is the important goal of students at higher education level (Wichai Wongyai, 1999: 18; Amornwit Nakormtap, 1999: 1; Somkit Issarawat, 2000: 169).

Educational technology is an important subject for teacher reformation. According to the study, it was found that Faculty of Education in various universities in Thailand has been offering such course on educational technology as a requirement for students who are going to become instructors in the future so that they are prepared for tools about educational technology. They can develop and apply technology in their instruction. Therefore, they have to learn principles, theories and skills essential for educational technology (Wasan Atisap, 2004: 11-12). Since the topic is wide, the students have to grasp the overall concept about educational technology first before they can go to other aspects. They have to practice how to use technological tools and
how to develop the media in various forms according to the set topics. There is less time for practice since there are many issues about the theories. As for practice, some students can neither follow up with the demonstration nor review their practice. They are not eager enough to seek knowledge about both theories and practice by themselves. In order to make them aware of the rapid changes in technology, an instruction model for the course on educational technology is to be sought in order to solve the problems arisen from such changes. Abilities to learn should be put to learners. In order to make it successful, technology should be used because traditional instruction alone cannot respond to students effectively any more. Computer technology and internet for instruction are widely used and known such as online learning, e-learning and Web-based instruction.

Web-based Instruction makes the best use of world wide web in learning. Online learning plays an important role in changing instruction forms by using the potential and the facility of technology and telecommunication system to facilitate the way the students learn. Now they can learn anywhere anytime without the limitations about the places and the schedule. Instruction is not teacher-based any more; it is now student-centered. Moreover, instead of learning individually, students learn in a collaborative manner. They change their roles from waiting for the knowledge to going out for the knowledge (Khan, 1997). Online learning has advantages for both instructors and learners (Tanomporn (Tanpipat) Laoharatsaeng, 2002: 18-19) like instructors can transfer the contents in various and more interesting ways through multimedia. Their classroom period becomes shorter so that instructors have time to learn new things. Moreover, instructors can observe the learning behaviors and the progress of each learner in details all the time through Course Management tool. Learners can learn according to their own paces. This is called “Self-paced learning” in which learners control their own lessons because hypermedia technology is integrated in such course with texts, still images, sounds, graphics and animations. Learners can access the information in any sequence. Furthermore, online learning helps facilitate the interaction among instructors, learners and peers because there are many tools for many kinds of interaction. There is no limitation about campus so students from numerous institutes can come and share their knowledge. Despite many advantages, there are also disadvantages like students must have high responsibility for their learning. They have to be eager to seek knowledge by themselves. They must be able to work with others and help their peers in time of need. This kind of instruction is quite new to many students, resulting in obstacles to them (Wichuda Rattanapian, 2005: 22-23). Besides, there are also limitations about time in that people are not free at the same time. They cannot learn at the same time. As for place, virtual places cannot replace physical places because face-to-face interaction and socialization are a part of building trust and team learning. Lack of face-to-face interaction can lead to nonconformity and bond in online community. Learners might not be brave enough to work and share knowledge with others (Na Ubon & Kimble, 2000).

According to the problems and limitations of web-based instruction, many approaches and methods of content presentation, including activities must be put on web sites so that Web-based Instruction becomes effective for self-directed learning. This kind of concept is related to Knowledge-based economy which every organization faces due to rapid changes and competitions. One of the popular strategies widely acknowledged is Knowledge Management or KM.

Knowledge management is mainly about using technique and various tools to collect scattered knowledge in the same place, making atmosphere where people are ready to think, learn and build new bodies of knowledge. The knowledge is organized in such a way that it can be retrieved with ease. Moreover, knowledge management allows people to have channels for exchanging knowledge in order that they apply the knowledge in their work with success (Davenport, 1994; Gavin, 1994; Prawase Wasee, 2002; Vicharn Panich, 2005). There are two kinds of knowledge (Nonaka; & Takeuchi. 2004: 53): Explicit knowledge is knowledge which can be collected, stored and transferred easily in the form of information technology or lessons specific to the demand of the learners. Tacit knowledge is knowledge accumulated from experience, proficiency and skills of an individual. It is hard to be collected and stored in a concrete way because this kind of knowledge is normally hidden in such individual. Therefore, the mechanism of meeting, trust and knowledge exchange has to be done. The main elements of knowledge management are humans, technology, and knowledge process. Humans are considered the most important element because they are the resources of knowledge. Technology is a tool to search for, store, exchange and make the best use of knowledge in an easy as well as fast manner. Knowledge process is a strategy for managing knowledge from users to users, resulting in system improvements and innovations. These three elements must be integrated in balance to make knowledge management successful. Using such approach with Web-based Instruction needs a certain kind of framework or a frame of practice which many scholars have already proposed. The users, therefore, need to understand and choose the best methods according to the contexts and situations.

According to the problems as cited above about the course on educational technology, the approach of knowledge management along with learning activities will help solve such problems because knowledge management strategies will help learners set their learning objectives, how to seek information, how to share the information, how to store and retrieve as well as make the best use of their knowledge. Learners will become more responsible for themselves and they can seek the knowledge by themselves. Therefore, the development of Web-based Instruction for the course on educational technology must comply with the knowledge management
strategies to solve the problems and the limitations found in traditional Web-based Instruction so that learners can learn, make and apply the knowledge for themselves. The results from this research will provide an understanding of effective and efficient Web-based Instruction which affects the learning achievements of educational technology course takers and the learning abilities of students at the higher education level.

Research Methodology

This research followed the research methodology as explained below:

Stage 1 The Development of a Web-based Instruction model by Using Knowledge Management Strategies on Educational Technology Subject for Higher Education Level

The researchers did the literature review from various sources like documents, books, journals and research works in order to get an overall picture of the approach appropriate for this research. There were in total 11 kinds of knowledge management strategies from all the sources both in Thailand and from foreign countries. The researchers put all kinds of them into a table to analyze and synthesize the procedure in knowledge management strategies. Afterwards, the Web-based Instruction was outlined with knowledge management strategies. The draft was reviewed by 3 experts in knowledge management and 3 experts in educational technology. The model based on knowledge management strategies was to be revised according to the experts’ suggestions.

Stage 2 The Study of Efficiency of Web-based Instruction model by Using Knowledge Management Strategies on Educational Technology Subject for Higher Education Level

After the revision model was acceptable, the model was used in developing web-based instruction. The structure of course description about educational technology was analyzed and included all the contents about Web-based Instruction and behavioral objectives in each chapter. The web-based instruction, after the complete development, was reviewed by 3 experts in educational technology in order to check the accuracy of the contents and the design techniques as well as content presentation. The Web-based Instruction was then tested to determine the efficiency whose criteria were set at 85/85. The test was done for 3 times with the sampling group. In the first time, it was tested with 3 students to check the basic quality in terms of the understanding of the contents, the meanings conveyed, the content presentation, and steps for activities. The data from the observation and the interview was used in order to revise the instruction. In the second time, it was done with 9 students to find out the tendency of efficiency of Web-based Instruction and to find out the errors. Then the instruction was revised. In the third time, it was done with 20 students to find out the efficiency of Web-based Instruction by using exercises and tests to measure learning achievements. After the students had completed each theory lesson, they had to do a test. Scores from each lesson test were used to find out the efficiency (E1). After the students had completed the course, they had to do the final test, the score was used to find out the efficiency (E2).

Stage 3 The Study of Effectiveness of Web-based Instruction model by Using Knowledge Management Strategies on Educational Technology Subject for Higher Education Level

After the Web-based Instruction was efficient, the course was to be used by the second year students majoring in education at Nakhon Ratchasima Rajabhat University. There were 240 students who registered for this course. The sampling group of 30 students was chosen by simple random sampling method by lottery system. The students did the pre-test and evaluated their learning abilities before learning by themselves. After the students had completed the course, they did the final test and evaluated their learning abilities again. They could express their opinions. The learning achievement scores before and after the course was compared. So were their learning abilities before and after the course. The opinions toward the Web-based Instruction were also collected.

Research Results

The development of Web-based Instruction model by using knowledge management strategies on educational technology subject for higher education level yielded the following results:

Results from the Development of Web-based Instruction model by Using Knowledge Management Strategies on Educational Technology Subject for Higher Education Level

The development of Web-based Instruction model by using knowledge management strategies on educational technology subject for higher education level as evaluated by experts was that the average scores for relevance and appropriateness was 4.58 or the highest level. The details were shown in Figure 1.
Elements of Model

The model of Web-based Instruction was developed according to the systematic approach consisting of 11 elements as follow: 1) goal; 2) objective; 3) contents; 4) computer system and internet network; 5) supporting factors; 6) instruction process; 7) interaction; 8) learners; 9) instructors; 10) experts in the course and 11) evaluation. Each element consisted of the following:

1. **Goal** was to be used as a norm for Web-based Instruction for students at higher education level. The idea, the principles of web design and knowledge management were integrated to help develop student-centered learning so that students have higher learning achievement for educational technology subject and they have abilities to learn by themselves at the higher education level.

2. **Objective** was to improve learning achievement for educational technology subject and develop abilities to learn on one’s own at higher education level.

3. **Contents** covered the topics about educational innovations, learning resources, information technology for education and computer for instruction. This subject had both the contents about theories and opportunities to practice.

4. **Computer system and Internet network** consisted of one server where the website was stored. It was connected to clients so that students can access the learning activities all the time.

5. **Supporting factors** consisted of
   5.1 Webpage which was considered as virtual classroom where students, instructors and experts in the course could meet
5.2 Virtual library was a place where students could seek information about the contents in the course from all over the world through internet network. This was facilitated by search engines on the web.

5.3 Supporting service which aided communication and exchange of knowledge through searchable and retrievable functionalities.

6. **Instruction process** was the process based on the approach in Web-based Instruction along with knowledge management strategies. The process was designed, analyzed and synthesized by many local and international scholars. This was known as “DASSU Model” which included 5 steps as follows: “Dream draw, Find acquisition, Share knowledge created by me and you, Keep in storage, and Use when necessary”. The details were as follows:

6.1. “Dream draw” (Defining: D) was an activity in which students set their learning goal by considering learning objectives of the subject. Then the students set BAR (Before Action Review) together and then did self-assessment in terms of the level of knowledge they belong to and what elements they knew and needed to know.

6.2 “Find acquisition” (Acquisition: A) was an activity in which students set approach or method to acquire knowledge by learning plan and then they had to follow the plan they designed.

6.3 “Share knowledge created by me and you” (Sharing: S) was an activity in which students shared their knowledge or what they knew with one another. They could create knowledge together by contributing to Wikipedia, blogs and communities united out of volition. There were 3 kinds of communities: 1) Community of Interest (Co-I), 2) Community of Practice (Co-P), and 3) Community of Expert (Co-E). Moreover, there were 3 strategies to integrate knowledge in this process as follows: 1) Codified & Personalized Strategies (S1), 2) Conversion & Spiral Strategies (S2), and 3) Technology & KM Techniques Strategies (S3).

6.4 “Keep in storage” (Storage: S) was an activity in which students did Benchmarking (B1) to make sure that the knowledge they acquired is accurate and to provide Best practice (B2) by refining, synthesizing, organizing the knowledge from Wikipedia, blogs of friends to summarize and create their own body of knowledge as well as write down systematically on their blogs.

6.5 “Use when necessary” (Utilization : U) was activity in which students tested their knowledge through activities in each topic. They would know their level of knowledge and make the best use of their knowledge. This was called AAR or “After Action Review” to summarize and evaluate the acquired knowledge together in groups. They would determine whether the knowledge meets the goal and why. They would find solutions for further improvements.

7. **Interaction** was an activity among members in the group of the same interest in which they discussed the topics, made contacts with instructors and experts in the course through website.

8. **Learners** had an important role in self-directed learning, especially Web-based Instruction because they had to share their knowledge and follow the activities offered in the course. They could ask for information and suggestion with instructors and experts in the course as well as their peers.

9. **Instructors** had a role to facilitate the learning of learners. They provided the students with tools ready to be used. They also tracked down and observed the way the students learn online so that they could come to help in the time of need when students found difficulties with web-based instruction. They also guided and motivated students to learn and complete all learning activities.

10. **Experts in the course** were experts in educational technology. They were chosen out of the lecturers who were specialized in educational technology. They made the best use of their knowledge and experience in assigning the tasks suitable for each individual in each topic. They gave guidance to students in every step of the learning process.

11. **Evaluation** was a kind of assessment done online. The learning achievement test was done before and after the course on educational technology in terms of knowledge, understanding, and application. The test consisted of 40 objective questions, each of which had 4 multiple choices. The learning achievement scores before and after the course were compared and evaluated through self-assessment tools and the students’ opinion towards Web-based Instruction model. Students’ behaviors and participation were also observed and evaluated according to the Web-based Instruction model.

**Results from the Study of Efficiency of Web-based Instruction model by Using Knowledge Management Strategies on Educational Technology Subject for Higher Education Level**

The development of Web-based Instruction model by using knowledge management strategies on educational technology subject for higher education level as evaluated by experts yielded the following results. The average score for the content suitability was 4.36 or at high level. The average score for the design and presentation technique was 4.38 or at high level. The test to find out effectiveness yielded the score of 87.13/86.25. To conclude, the Web-based Instruction model by using knowledge management strategies on educational technology subject for higher education level corresponded with 85/85 provided criteria. That is to say, the model was efficient and suitable for students at higher education level.

**Results from the Study of Effectiveness of Web-based Instruction model by Using Knowledge Management Strategies on Educational Technology Subject for Higher Education Level**
It was found that the pre-test and post-test average scores in achievement of students were statistically significantly different at 0.01 level. The post-test average scores in achievement of students were higher. The ability to learn on one’s own was also improved. The students’ opinion towards learning through the Web-based Instruction model was 4.32 on average or acceptable.

Discussions

According to the development of Web-based Instruction model by using knowledge management strategies on educational technology subject for higher education level, there were 2 issues to be discussed: 1) the development of Web-based Instruction and 2) the study of efficiency of the learning through web-based instruction.

1. As for the development of Web-based Instruction model by using knowledge management strategies on educational technology subject for higher education level, the issues to be discussed were given below:

1.1 The results from the development of Web-based Instruction model by using knowledge management strategies on educational technology subject for higher education level yielded the supporting factors as follows:

1) The development of Web-based Instruction model in a systematical manner. The web site was developed systematically and processed in a step-by-step manner by analysis and synthesis of the traditional instruction. The philosophy in education was also applied to emphasize on the self-directed learning, in which the students were the one to create knowledge. Other theories used in the course were theories about behaviorism, motivation, approach in web-based instruction, knowledge management strategies. The elements of Web-based Instruction were analyzed and synthesized into the model which was revised many times according to the suggestions by experts. The model was tested for the efficiency before real use.

2) Instruction process consisted of 5 activities which came from analysis and synthesis of knowledge management strategies proposed by scholars in Thailand and abroad. The results from the synthesis were used to provide students with activities suitable for web-based instruction. Those were defining, acquisition, sharing, storage, and utilization. To make them easy to remember, the activities were given new names as follows: “Dream draw, Find acquisition, Share knowledge created by me and you, Keep in storage, and Use when necessary”. The steps corresponded with the student-based instruction in which the students were the center of the instruction. The students know themselves, know the world and depend on themselves in terms of economy, spirit, society and learning. They were happy to learn (Prawase Wasee, 1999). This corresponds with the Self-directed Learning in which the students set their goal and plan the learning path by themselves. They control and evaluate themselves by seeking the methods suitable for their success in learning (Oladoke, 2006: 13)

1.2 According to the test to find out the efficiency of the Web-based Instruction model by using knowledge management strategies on educational technology subject for higher education level, the issues to be discussed were given below:

2. As for the study of the Web-based Instruction model by using knowledge management strategies on educational technology subject for higher education level, it was found as follows:

2.1 The post-test average scores in achievement were higher than the pre-test average scores in achievement. This indicates that the instruction model could be used as a tool to facilitate learning because the Web-based Instruction was developed in a systematic order, allowing all students to participate in studying and doing revision for all the topics from seeking the contents to posting in Wikipedia. This corresponds with the strategies proposed by Hansen & et al (2004) in that codified strategy is suitable for explicit knowledge. The organization with a server benefits from this by encoding knowledge and storing it in an accessible database where everybody can get connected. Due to the limitation that the contents to be posted had to be different from others, the students had to read all the information first before posting. This way, the students got higher post-test average scores in achievement.

2.2 The learning abilities of students were improved after the course indicated that the instruction model helped the students to improve their learning abilities due to the following reasons:

2.2.1 The instruction model was based on knowledge management strategies and included 5 activities. This was done through analysis and synthesis proposed by scholars in Thailand and abroad. The activities focused on the participation by students from the first stage like setting their goal, defining how to learn, evaluating what they already know, and planning to the last stage like following the plan and evaluating. The students were responsible for their own learning. Their practice was recorded in portfolio and posted in blogs, allowing other students to do a revision and correct their goal according to their plans.

2.2.2 As for the application of technology and technique in knowledge management, the technology used consisted of Course Management Systems (CMS), webboard, chatroom, and blogs. These tools were learning resources and factors for accessibility as well as interaction between instructors and students and
among students. This technology resolved the limitations of students in terms of time and place. They could also chat online to discuss at the same time, increasing the level of interaction. They could trust and confide in the online community. They were also voluntary in working together as well as sharing information. Knowledge management technique which reduced the instructional limitations consisted of 2 things: First, process management which is to make sharing and applying knowledge easier to be done by the most of the participants through awards like gifts and scores; Second, space management which is to create an atmosphere where students can know and trust one another in the end. This idea corresponds with Na Ubon & Kimble (2002) in that confiding in each other is the base of sharing knowledge which leads to effective knowledge sharing and transferring.

2.2.3 Knowledge could be shared by all participants. The atmosphere facilitates the learning through online community. There were many activities and people shared knowledge with all members in chatroom through knowledge conversion process and knowledge spiral according to SECI Model proposed by Nonaka & Takeuchi (1995). This model was adopted in supporting education through self-learning educational technology. The students could learn individually and learn in group (group-learning). This was to transform tacit knowledge to explicit knowledge by using computer as a tool. Students could learn by various methods, increasing their achievement and learning abilities after the course.

Suggestions

The Web-based Instruction model by using knowledge management strategies on educational technology subject for higher education level was developed with the approach that all students are able to improve themselves. Learners are the most important element. Therefore, instruction should correspond with their preference and skills by considering their differences among them. This way, students will have abilities to learn by themselves. The approach meets the trend of current education which focuses on life-long learning.

1. Suggestions for Using this Instruction Model

1.1 The application of Web-based Instruction should be based on the readiness of many elements, especially the readiness of students. There should be an orientation for students so that they understand the objectives of learning in this way. The students also have more responsibilities in their learning. They should know the benefits and have to get familiar with the technology. The instructors need to prepare themselves too. They must provide students with time for guidance and help. They have to know how to use the tools for instruction. Computers and server are also important. They must be ready for use all the time.

1.2 To make the instruction model effective, it can be used both online and face-to-face, or mixed. However, the activities should be done in the organized steps.

1.3 To apply the instruction model with various factors like space, time, event and people (STEP: Space: S, Time: T, Event: E, People: P), the space or place to be used can be real or virtual. If the space is virtual and people are not free at the same time, the exchange of knowledge cannot be done. Time to engage in the activities is, therefore, essential. As for event and people, the model should be adapted to correspond with the event and the group of people.

1.4 The roles and the responsibility of members should be clarified so that they are ready for the proper use of the technology, making the instruction model effective to the maximum.

2. Suggestions for Further Studies

For further studies, the researcher gives the following suggestions.

2.1 The Web-based Instruction model should be applied in other subjects or courses and then the comparison of the permanence of the model is done so that we achieve the general instruction model by using knowledge management strategies.

2.2 The effectiveness of the instruction model in terms of changed learning behaviors should be studied by using knowledge management strategies and learning styles in real life.

References


