Development of an Electronic Learning Program for Enhancing Comprehensive Midwifery Competency Among Undergraduate Nursing Students

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ชื่อวิทยานิพนธ์ การพัฒนาโปรแกรมการเรียนรู้ผ่านสื่ออิเลกทรอนิกส์เพื่อสร้างเสริมสมรรถนะความรอบรู้ทางการผดุงครรภ์ในนักศึกษาพยาบาลหลักสูตรพยาบาลศาสตรบัณฑิต

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บทคัดย่อ

การวิจัยนี้มีวัตถุประสงค์เพื่อพัฒนาโปรแกรมการเรียนรู้ผ่านสื่ออิเลกทรอนิกส์เพื่อสร้างเสริมสมรรถนะความรอบรู้ด้านการผดุงครรภ์สำหรับนักศึกษาพยาบาล ประเมินความเหมาะสมและประเมินประสิทธิภาพของการนำโปรแกรมมาใช้ ขั้นตอนแรกเป็นการพัฒนาโปรแกรมแบ่งเป็น 4 ระยะ คือ การพัฒนาสาระสำคัญของสมรรถนะความรอบรู้ทางการผดุงครรภ์ การออกแบบบทเรียนโปรแกรม การตรวจสอบความตรงของเนื้อหาบทเรียน ความเหมาะสมในระบบการใช้งานของโปรแกรม และการทดลองใช้โปรแกรม สำหรับขั้นตอนหลังเป็นการประเมินประเมินประสิทธิภาพของโปรแกรมที่ได้พัฒนาขึ้น โดยการตรวจสอบความเหมาะสมในการใช้งานและประเมินประสิทธิภาพของโปรแกรมต่อการสร้างเสริมสมรรถนะความรอบรู้ทางการผดุงครรภ์ในนักศึกษาพยาบาล ชั้นปีที่ 4 จำนวน 77 คนโดยแบ่งเป็น 2 กลุ่ม คือ กลุ่มที่ใช้โปรแกรม 36 คน และกลุ่มควบคุม 41 คน ทั้งสองกลุ่มได้รับการทดสอบสมรรถนะความรอบรู้ทางการผดุงครรภ์ก่อนและหลังการเรียนด้วยโปรแกรม

ผลการศึกษา พบว่าโปรแกรมการเรียนรู้ผ่านสื่ออิเลกทรอนิกส์ที่พัฒนาขึ้นมี 6 บทเรียน ซึ่งได้นำมาออกแบบเป็นบทเรียนเสริมผ่านเว็บไซต์ เนื้อหาของบทเรียนได้รับการตรวจสอบโดยผู้ทรงคุณวุฒิ 5 ท่าน ได้ค่าดัชนีความความตรงตามเนื้อหาของทุกบทเรียนในระดับสูง (CVI = 0.8 - 1.0) ความเหมาะสมในการนำไปใช้ของโปรแกรมได้รับการเห็นชอบโดยผู้ทรงคุณวุฒิ 3 ท่าน และเมื่อนำโปรแกรมไปใช้จริง พบว่านักศึกษามีความพึงพอใจต่อโปรแกรมในระดับสูง (M = 3.78, SD = .21) ส่วนการทดสอบประสิทธิภาพของโปรแกรมต่อการสร้างเสริมสมรรถนะความรอบรู้ทางการผดุงครรภ์ ได้ผล 3 ประการ คือ 1) นักศึกษากลุ่มที่เรียนด้วยโปรแกรม มีจำนวนคนที่ผ่านเกณฑ์การทดสอบสมรรถนะความรอบรู้ทางการผดุงครรภ์หลังการเรียน (n = 22, 61.11%) เพิ่มขึ้นกว่าก่อนการเรียน (n = 12, 33%) เมื่อเปรียบเทียบจำนวนคนที่ผ่านเกณฑ์การทดสอบก่อนและหลังการใช้โปรแกรมด้วยไควสแควร์ พบว่ามีความแตกต่างกันอย่างมีนัยสำคัญทางสถิติ (χ^2= 9.13, p < .01) 2) คะแนนเฉลี่ยของการทดสอบสมรรถนะความรอบรู้ทางการผดุงครรภ์หลังการเรียนด้วยโปรแกรมสูงกว่าก่อนการเรียนอย่างมีนัยสำคัญทางสถิติ (t = -9.38, p < .001) และ 3) นักศึกษากลุ่มที่เรียนด้วยโปรแกรม มีจำนวนคนที่ผ่านเกณฑ์ในการทดสอบครั้งหลังมากกว่ากลุ่มควบคุม (n = 22, 61.11% และ n = 10, 24.39% ตามลำดับ) และพบว่าคะแนนเฉลี่ยของการทดสอบสมรรถนะความรอบรู้ทางการผดุงครรภ์หลังการเรียนด้วยโปรแกรมสูงกว่ากลุ่มควบคุมอย่างมีนัยสำคัญทางสถิติ (t = 4.01, p < .001).

จากผลการศึกษาครั้งนี้ สรุปได้ว่าโปรแกรมการเรียนรู้ผ่านสื่ออิเลกทรอนิกส์ที่พัฒนาขึ้นใหม่นี้มีประสิทธิภาพต่อการสร้างเสริมสมรรถนะความรอบรู้ทางการผดุงครรภ์ของนักศึกษาพยาบาล กระบวนการพัฒนาโปรแกรมนี้อาจใช้เป็นแนวทางสำหรับอาจารย์พยาบาลในการออกแบบโปรแกรมที่มีประสิทธิภาพ เพื่อการพัฒนาสมรรถนะทางการพยาบาลของไทย

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ABSTRACT

The purpose of this study was to develop the electronic learning (e-learning) program for enhancing midwifery competency among nursing students and evaluate its feasibility and effectiveness. The development phase was organized into four steps: identifying the structure of comprehensive midwifery competency, designing learning modules, content and program appropriateness verification, and pilot testing of the program. The evaluation phase aimed to determine feasibility and effectiveness of the newly developed program. A two-group pre-post test of comprehensive midwifery competency (CMC) between an e-learning group (n = 36) and a control group (n = 41) was used to determine the effectiveness of the program.

The findings resulted in obtaining the structure of comprehensive midwifery competency and designing it into six learning modules. These modules were integrated into the e-learning program that was a web-based supplementary course. The components of the learning modules were examined by five experts, yielding a high validity (CVI = 0.8 - 1.0). Its function was examined by three experts. All program features were determined as appropriate for use. Its feasibility was examined by 36 nursing students and they rated a high level of satisfaction to the overall

program (M = 3.78, SD = .21). The effectiveness of the program was supported by three evidences. Firstly, the number of nursing students in the e-learning group who reached the CMC criteria ($\geq$ 70% of the total score) after using the e-learning program (n = 22, 61.11%) was more than those before using the program (n = 12, 33.33%). Comparing the number of students who reached the CMC criteria of the two-time testing, it was found that a statistically significant higher number of students met the achievement criteria after using the program ($\chi^2 = 9.13$, $p < .01$). Secondly, the mean of CMC scores in the e-learning group on the post-test was statistically significant higher than those on the pre-test ($t = -9.38$, $p < .001$). Lastly, the number of nursing students in the e-learning group who reached the CMC criteria of the post-test was more than those in the control group (n = 22, 61.11% and n = 10, 24.39%, respectively). Comparing the differences of mean CMC post-test scores between the two groups, it was found that the e-learning group had a statistically significant higher score than the control group ($t = 4.01$, $p < .001$).

The findings suggest that the newly developed e-learning program would be effective in enhancing midwifery competency of nursing students. The processes of program development can guide nursing educators in designing effective e-learning programs for developing nursing competency, especially among Thai nurses.

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CHAPTER 1

INTRODUCTION

Background

The health-care environment is rapidly changing and health care professionals need to practice with current knowledge, and appropriate clinical decision making skills. Knowledge and clinical decision making skills are also recognized as an essential professional competency in order for practitioners to take effective responsibility (Haggerty & Nuttall, 2000; Hendry & Walker, 2004; Shin, 1998). The nursing profession, as a major group in the health care system, has developed into an identifiable, separated discipline, and a specialized body of knowledge called nursing science (Catalano, 2003).

The evolving health care practice arena requires nurses who are capable of providing safe, competent and efficient care within an increasingly complex array of patient care needs and interdisciplinary healthcare teams (Gul & Boman, 2006). Registered nurses (RNs) who have been educated at the associate, diploma, or baccalaureate level have been considered well-prepared to meet the needs in the current health care system (Catalano, 2003). Therefore, credentialing for nurses has been developed to ensure their competency in providing quality of care.

The Thailand Nursing and Midwifery Council (TNMC), as a non-government institution, has the responsibility to ensure the quality of individual nurses by approving both the schools of nursing and individual nurses. The TNMC has powers and responsibilities to arrange for registration and licensing of those who apply for

permission to practice nursing and/or midwifery and to suspend or revoke a nursing and/or midwifery license. The TNMC has particularly stipulated that undergraduate nurses in a four-year baccalaureate curriculum have to pass the examination of knowledge for registration and receipt of a license to be a practitioner of nursing and midwifery (Ander & Kunaviktikul, 1999; International Affairs Subcommittee, 1997). The regulation of the TNMC is a legal activity conducted to approve that a nurse is qualified to practice nursing.

In a four-year undergraduate program, nursing schools and the Thailand Nursing and Midwifery Council have to assure the public that a graduate nurse has achieved the requirements of nursing standards for practice by having the license. Nursing schools also have implemented a comprehensive nursing knowledge examination for nursing students in order to assess knowledge competence prior to their graduation. Later, the graduated students will apply for nursing license administered and issued by the TNMC. Both examinations are organized to ensure that each nursing student has knowledge and competence to be a registered nurse (RN). Gaining a nursing license indicates that a graduated nurse is a competent professional practitioner.

Similarly, in the USA, the National Council Licensure Examination or NCLEX has been established to assess nursing students' competencies due to ensure public safety. Several strategies have been used to prepare students for the NCLEX. These strategies include combined interventions of instruction on test-taking, participation in learning teams, faculty follow-up (Frierson, Malone, & Shelton; 1993), and support groups (Brown, 1987; Crow, Handley, Morrison, & Shelton, 2004). Additionally, computerized NCLEX programs have been used to prepare and

evaluate graduating students and reported as effective strategies. (Nibert, Young, & Britt: 2003; Ross, Nice, May, & Billings, 1996). These strategies could reduce graduating students' anxiety of taking the national examination. It can be concluded that the majority of these strategies involve the use of information technology.

In Thailand, nursing schools have a challenging role to educate their students through suitable curricula so that they can be competent nurses. To be a competent nurse in Thailand requires both nursing and midwifery competency. Midwifery competency is a major public concern worldwide. It is a part of maternal and newborn healthcare in which the well-being of mother and child has been identified as an important indicator of societies. In addition, maternal and newborn health has continually been declared by the Thai National Health Development Plan (NHDP) as a top priority issue since the third NHDP (World Health Organization [WHO], 2004).

Having nursing students who are competent and capable to provide quality care to mothers and newborns is a human resource development which will contribute to the obligations stated in the 10th NHDP declaration of the Thai Ministry of Public Health (Department of Health, 2008).

However, midwifery seems to be the most difficulty competency for nursing students to acquire. This evidence is supported by a failure rate of nursing students who took the national nursing licensure examination. The data collected by the TNMC on 454 nursing students from four nursing schools in southern Thailand taking the licensure examination indicated ineffective learning strategies in the area of midwifery (TNMC, 2008). The result revealed a relatively high percentage (25%) of nursing students did not pass midwifery examination during their first attempt. This was compared to 10.60% and 7.14% failure rates in adult and geriatric examination.

This data strongly indicated that many new graduated nurses could not meet the minimum standard of nursing competency at their first attempt.

Two possible reasons, curriculum transformation and reduction rate of childbirth using normal delivery, may cause the low passing rate of students on licensure examination in midwifery. The change in the nursing curriculum may reduce the opportunity of students in midwifery training. In the earlier program, four-years of undergraduate nursing study with an extra six-month training in midwifery provided rich experience for the midwifery students. Meanwhile the current program has required completion of both general nursing care and midwifery within four years for general nurses (Hanucharurnkul, 2001). As a result, the students are unable to gain experience in clinical practice. In addition, the rate of childbirth using normal delivery has been reduced (WHO, 2004). Because of technology assistance in labor and delivery, the caesarean section rate has increased since 1990 (Tangcharoensathien, Lertiendumrong, Hanvoravongchai, Mills, A., & Bennett, 2006). As a result, some students had delivered only a few babies (Ander & Kunaviktikul, 1999). Therefore, the change in nursing curriculum and the reduction rate of normal childbirth delivery may limit students from gaining experience in midwifery.

As mentioned previously, those causes were hypothesized that nursing students nowadays rarely achieve a standard of professional competency, especially in the midwifery section. Accordingly, an urgently supplementary learning program is needed in order to strengthen nursing students in midwifery competency. It is also aimed to assist graduating nurses to be more competent RNs and successfully passing examination.

Currently, a teaching-learning approach has been changed from teacher-centered to student-centered, the implication of electronic learning (e-learning) has developed and expanded (Kala, Isaramalai, & Pohthong, 2009). The benefits of e-learning have been widely recognized. These benefits include providing consistency of education delivery, reducing instruction time, enhancing cognitive recall and mastery of learning, increasing students' motivation and satisfaction (Denny & Higgins, 2003; Herriot, Bishop, Kelly, Murphy, & Truby, 2003; Lewis, Davies, Jenkins, & Tait, 2005). Additionally, it is provided in a more learner-centered manner (Al-Dujaily & Ryu, 2006) and is an active learning (Kenny, 2002). It is convenient, available, and economical (Huckstadt & Hayes, 2005). Thus, the advantages of e-learning are attractive to be integrated into nursing education.

Nurse educators who are taking important roles in nursing education need to consider the advantages of e-learning and incorporate it into nursing education. An electronic learning program can be conducted to prepare and encourage nursing students to be more knowledgeable. It will also facilitate students to create appropriate clinical decision-making skills in nursing. Therefore, the development of electronic learning program as a supplementary course would be crucial for enhancing the comprehensive midwifery nursing competency among nursing students.

A well-designed program would assist students to review and create their knowledge and clinical decision-making skills so that they can successfully pass examinations organized by nursing schools and the Thailand Nursing and Midwifery Council. The component of clinical decision making skills of the program would also assist students to be competent practitioners.

Objectives

The objectives of this study are to:

1. Develop an electronic learning program for enhancing comprehensive midwifery competency among undergraduate nursing students.
2. Evaluate appropriateness of the electronic learning program.
3. Evaluate feasibility (practicability) of the electronic learning program.
4. Evaluate effectiveness of the electronic learning program on students' comprehensive midwifery competency (CMC).

Research Questions

The following research questions are investigated:

1. What are the core content and structure of the electronic learning program for enhancing midwifery competency among undergraduate nursing students?
2. How appropriateness of the electronic learning program is?
3. How feasibility of the electronic learning program is?
4. How effectiveness of the electronic learning program is?

Research Hypotheses

The specific hypotheses related to learning outcomes are as follows:

1. In the e-learning group, numbers of nursing students who reached the CMC criterion (getting at least seventy percent of total score) in the post-test would be significantly increased when compared to those in their pre-test.

2. Nursing students who had learned through the e-learning program would report a significantly higher mean score of CMC in the post-test than their mean score in the pre-test.

3. Nursing students who had learned through the e-learning program would report a significantly higher post-test mean score of CMC than those of the control group.

Scope of the Study

This study involved the development and evaluation the properties of an e-learning program. The achievement of four objectives as outlined above, was expected from the study. In the development phase, the participants were newly registered nurses (1 year graduated), registered nurses who have ≥ 5 years experience in midwifery nursing, and nurse educators who were teaching midwifery in an undergraduate program in Thailand. In the evaluation phase, forth-year nursing students in an undergraduate program were the participants.

Significance of the Study

The results of this study would be valuable for nursing, especially nursing education in terms of:

1. The electronic learning program would be useful as a supplementary course for nurse educators to facilitate nursing students to be competent in midwifery core knowledge and decision-making skills, and ensure their achievement of licensure. It may also be beneficial for health care managers to use the electronic

learning program for training their staff to be more competent in midwifery, and giving quality care to the public.

2. The developing processes in this study would provide guides for further research studies, especially the development of electronic learning programs in nursing education.

Conceptual Framework

The study was conducted based on an evaluation framework, learning theory, concepts of comprehensive midwifery competency, and a program development. Firstly, a Context Input Process Product (CIPP) model is an evaluation framework which was developed by Daniel Stufflebeam (Stufflebeam, 2003). The CIPP model was used in this study as an organizing framework for developing and evaluating the program. The CIPP model is based on a context, input, process, and product evaluation. Secondly, learning theory based on constructivism that has initiated by Vygotsky (McMahon, 2007) was focused. The constructivism was used to guide the procedures and structure of the learning program environment that focused on students' learning process including active learning, interaction with peers and facilitating learners to construct new knowledge in their learning experiences. Thirdly, a concept of comprehensive midwifery competency was used to guide the program's content (Thailand Nursing and Midwifery Council [TNMC], 2006). Fourthly, a program development concept conducted by integrating the processes of educational program development was used to guide the construction of nursing educational program. (Alewijnse, Mesters, Metsemakers, & van den Borne, 2002; van Berlo,

Lowyck, & Schaafstal, 2007; Escoffery, McCormick, & Beteman, 2004) The conceptual framework of this study is addressed as shown in Figure 1.

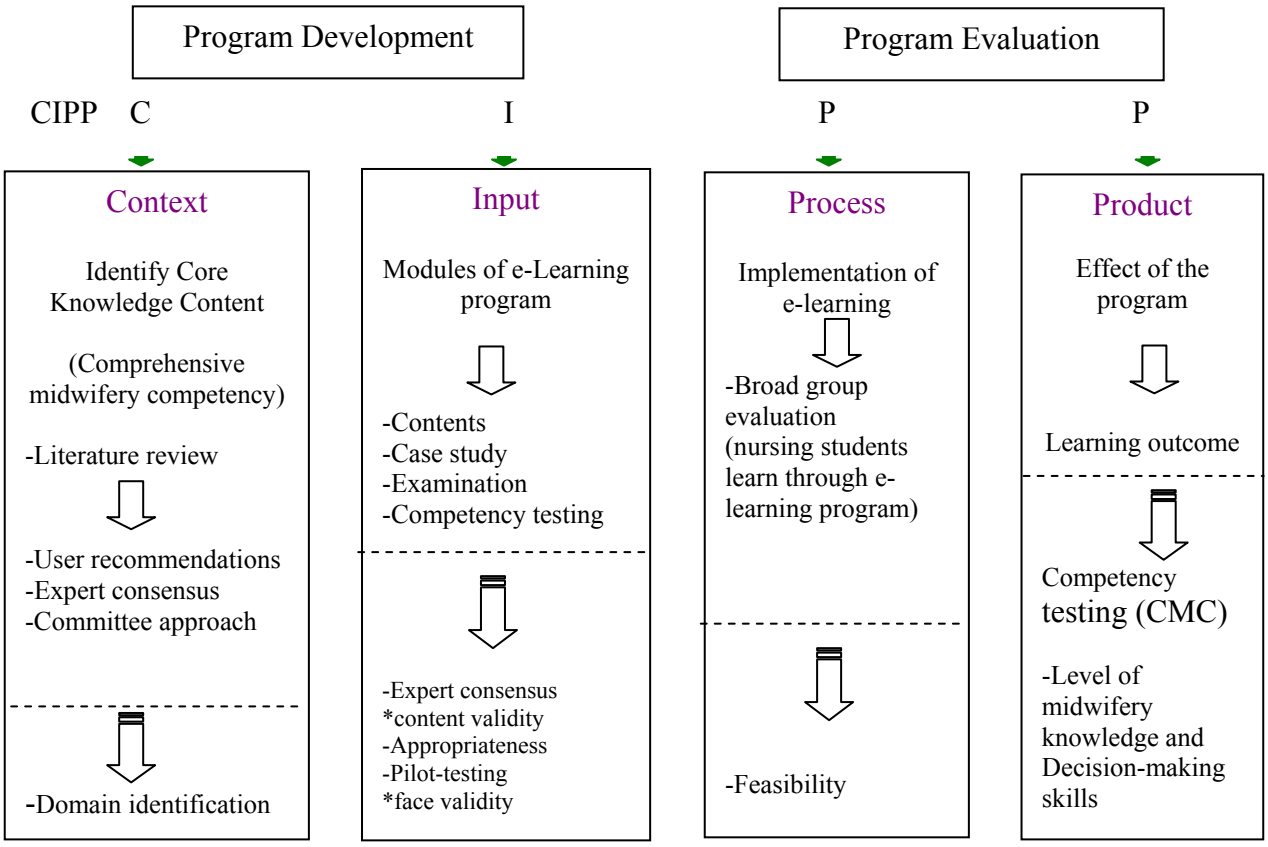

Figure 1. Conceptual framework of the study.

Definition of Terms

The *Electronic learning program* refers to the intensive learning module in web-based created by combining digitally delivered content with learning support to enhance comprehensive midwifery competency. The electronic learning program provides specific content of midwifery knowledge for supplementary course. In addition, a computer-based test administers pre-test and post-test to test for mastery

and self evaluation of learning. This program is designed from literature reviews, and investigations into users' perspective and experts' judgment before being applied into an application program; Moodle as a learning management system. Then, the appropriateness, feasibility and effectiveness were investigated.

Midwifery refers to the care provided for women, newborns and their families during the intrapartum period and the care for high risk pregnancy during antepartum, intrapartum and postpartum period.

Comprehensive midwifery competency (CMC) refers to knowledge and clinical decision making skills, which relates to the care provided for women, newborns and their families during intrapartum periods and the care for high risk pregnancy. The content emphasized both reproductive women during labor and delivery, and high risk conditions. The CMC is evaluated on the basis of two aspects including levels of core midwifery knowledge and decision-making skills. The CMC testing consists of multiple choice questions with four answer options. This tool is developed by the researcher in this study. High scores indicate good comprehensive midwifery competency, contrary to low scores that indicate less comprehensive midwifery competency.

Appropriateness of electronic learning program refers to program's functional system. The appropriateness questionnaire is conducted by the researcher and developed from literature reviews. Content validity of the questionnaire evaluated from three experts. After the modification under the experts' suggestions, the appropriateness questionnaire is used to evaluate the program's functional system prior to program implementation.

Feasibility/practicability of electronic learning program refers to the satisfaction of nursing students on using the electronic learning program. The satisfaction questionnaire is conducted by the researcher and developed from literature reviews. High scores indicated more satisfaction whereas low scores indicated less satisfaction.

Effectiveness of electronic learning program refers to ability of the program to produce desire outcome. The effectiveness of the program is determined if the students in the e-learning group getting more scores of comprehensive midwifery competency testing after learning through electronic learning program when compare to the scores of students in the control group. The number of students' achievement to the CMC criterion; getting seventy percent of total score, is also used as an indicator.

CHAPTER 2

LITERATURE REVIEW

The literature reviews and previous studies emphasize three main topics including 1) nursing education and nursing licensure in Thailand, 2) conceptual foundations related to developing an electronic learning program for enhancing midwifery competency: CIPP; learning theory; midwifery competency; and program development, and 3) existing knowledge of electronic learning programs in nursing education.

Nursing Education and Nursing Licensure in Thailand

Nursing education in Thailand

Nursing education in Thailand was established in 1896 by Queen Sripatchariantra. The high maternal death rate and the loss of her own infant child motivated the Queen to bring modern nursing to Thailand. At first, a one year curriculum was designed to reduce infant and maternal mortality (Ander & Kunaviktikul, 1999). The creation of an original nursing curriculum was highlighted in the midwifery skills. After that, the nurse training programme was adjusted and developed many times (Langkarpint, 2005). The first baccalaureate degree program, a four year program for nursing (Bachelor of Science in Nursing) was established in 1956 at Siriraj. In 1960, the program was changed to a three-year program for Diploma in Nursing. In those two programs, the midwifery training was separated from the general nursing course. An extra six-month training was required for

students to gain their midwifery certification (Hanucharurnkul, 2001). By 1978, all nursing colleges required 4 years of education in which general nurses need to be competent for both in the general nursing and midwifery (Ander & Kunaviktikul, 1999). The curriculum transformation may reduce students' opportunity in the midwifery training that causes the low successful rate of students taking the licensure examination in the midwifery section, as mentioned earlier in chapter 1.

Nursing licensure in Thailand

The licensing law began the national regulation of nursing practice in 1975 and was revised in 1997. The definition and scope of nursing practice was modified with that revision. The Thailand Nursing and Midwifery Council (TNMC) established in 1975. The TNMC is responsible for overseeing nursing practice. The TNMC represents the voice of professional nurse and midwifery and also has an important role in providing justice and welfare of its member (Ander & Kunaviktikul, 1999).

In addition, the TNMC has the responsibility to ensure the quality of individual nurses by approving both the schools of nursing and individual nurses. The TNMC has powers and responsibilities to arrange for registration and licensing of those who apply for permission to practice nursing and/or midwifery and to suspend or revoke a nursing and/or midwifery license. The TNMC has particularly stipulated that undergraduate nurses in a four-year baccalaureate curriculum have to pass the examination of knowledge for registration and receipt of a license to be a practitioner of nursing and midwifery (Ander & Kunaviktikul, 1999; International Affairs Subcommittee, 1997).

In 1998, the TMMC organized the first national examination for nursing graduates. All graduating nurses have to pass this examination before getting licensed to be legal nurses. At first, the examination covers six subjects then two more subjects were added. The licensure examination is administered three times a year. The student must pass each individual section, and the license is renewed every 5 years (Ander & Kunaviktikul, 1999; International Affairs Subcommittee, 1997).

The regulation of the TNMC is a legal activity conducted to approve that a nurse is qualified to practice nursing. The TNMC also has authority to approve the degree, diploma and certificate. Each institution of nursing education has to be accredited by the council. The seventy percent of undergraduate nursing students of each school who pass the license examination is recognized as an important indicator of their nursing school's standard.

In a four-year undergraduate program, nursing schools and the Thailand Nursing and Midwifery Council have to assure the public that a graduate nurse has achieved the requirements of nursing standards for practice by having the license. Nursing schools also have implemented a comprehensive nursing knowledge examination for nursing students in order to assess knowledge competence prior to their graduation. Later, the graduated students will apply for nursing license administered and issued by the TNMC. Both examinations are organized to ensure that each nursing student has knowledge and competence to be a registered nurse (RN). Gaining a nursing license indicates that a graduated nurse is a competent professional practitioner.

Nowadays, nursing becomes an important healthcare professional. Nursing knowledge and decision-making skills are recognized as essential competencies for

practitioners who are taking effective responsibility in healthcare service (Haggerty & Nuttall, 2000; Hendry & Walker, 2004; Shin, 1998). Registered nurses (RNs) who have been educated at a baccalaureate level are considered to be well-prepared to work in the present health care system that focuses on the quality of care. Consequently, the Thailand nursing and Midwifery council (TNMC), as a non-government, regulatory institution, has the responsibility to ensure quality of individual nurses for the public by approving both schools of nursing and nursing competencies.

To ensure student competency, schools of nursing have a challenging role of teaching and training individual nursing students to be knowledgeable RNs that would pass a license examination. It is believed that knowledgeable nurses will give quality nursing care to the public. Therefore, well-prepared nurses would give quality nursing care to the public.

In recent years, the integration of electronic learning has been recognized as beneficial for effective learning for these nursing students. The advantages of electronic learning programs are challenging to integrate into nursing education. Moreover, no electronic learning program for nursing students currently exists in Thailand, especially, for enhancing comprehensive midwifery competency core knowledge and clinical decision making skills. Therefore, the development of an electronic learning program would be a challenging role for an educator, in order to train individual nurses to be competent.

Conceptual Foundations

The context input process and product (CIPP) model, learning theory, concept of comprehensive midwifery competency, and program development were used to guide the development and evaluation of the electronic learning program for enhancing comprehensive midwifery competency of this study.

Context input process and product (CIPP) model

The CIPP model was used as an organizing framework for developing the program. The CIPP model was developed by Daniel Stufflebeam and colleagues in the 1960s (Robinson, 2002). This model is a comprehensive framework for guiding formative and summative evaluations of projects, programs, personnel, products, institutions, and systems. The model is configured for use in internal evaluations conducted by an organization's evaluators, self evaluations conducted by project teams or individual service providers, and contracted or mandated external evaluations. Stufflebeam (2003) stated that the model has been employed throughout the U.S. and around the world in short-term and long-term investigations-both small and large. Applications have spanned various disciplines and service areas, including education, housing and community development, transportation safety, and military personnel review systems.

Robinson (2002) stated that CIPP is a decision-focused approach to evaluation, and emphasized the systematic provision of information for program management and operation. In this approach, information is seen as most valuable when it helps program managers to make better decisions, so evaluation activities should be planned to coordinate with the decision needs of program staff. Data

collection and reporting are then undertaken in order to promote more effective program management. Since programs change as they are implemented, decision-makers' needs will change, therefore evaluation activities have to adapt to meet these changing needs as well as ensuring continuity of focus where appropriate, in order to trace development and performance over time. The CIPP model was developed as a means of linking evaluation with programme decision-making. It aims to provide an analytic and rational basis for programme decision-making, based on a cycle of planning, structuring, implementing and recycling decisions, each examined through a different aspect of evaluation - context, input, process and product evaluation.

1. Core concepts of CIPP model

The model's core concepts are denoted by the acronym CIPP, which stands for evaluation of an entity's context, input, process, and product. Therefore, the four aspects of CIPP evaluation are clarified with the four basic questions to assist a decision-maker for program development as follows (Stufflebeam, 2003).

1.1 Context evaluation is used to assess needs, problems, assets, and opportunities to help decision makers define goals and priorities. Therefore, the basic question in this respect is "What should we do?" For example, a context evaluation of a literacy program might involve an analysis of the existing objectives of the literacy program, literacy achievement test scores, staff concerns (general and particular), literacy policies and plans and community concerns, perceptions or attitudes and needs.

1.2 Input evaluation is used to assess alternative approaches, competing action plans, staffing plans, and budgets for their feasibility and potential cost-effectiveness to meet targeted needs and achieve goals. The basic question in this

respect is “How should we do it?” Therefore, decision makers use input evaluations in choosing among competing plans, writing funding proposals, allocating resources, assigning staff, scheduling work, and ultimately in helping others judge an effort’s plans and budget.

1.3 Process evaluation is employed to assess the implementation of plans to help staff carry out activities and later help the broad group of users judge program performance and interpret outcomes. Therefore, the basic question in this respect is “Are we doing it as planned?” This aspect provides decision-makers with information about how well the program is being implemented. By continuously monitoring the program, decision-makers learn such things as how well it is following the plans and guidelines, conflicts arising, staff support and morale, strengths and weaknesses of materials, delivery and budgeting problems.

1.4 Product evaluation is utilized to identify and assess outcomes intended and unintended, short term and long term; both to help staff keep an enterprise focused on achieving important outcomes, and ultimately to help the broader group of users gauge the effort’s success in meeting targeted needs. The basic question in this respect is “Did the program work?” By measuring the actual outcomes and comparing them to the anticipated outcomes, decision-makers are better able to decide if the program should be continued, modified, or dropped altogether. This is the essence of product evaluation.

Robinson (2002) summarized the four aspects of evaluation in the CIPP model which support different types of decisions and questions (see Table 1).

Table 1

Different Types of Decision and Questions Classified by Four Aspects of Evaluation in the CIPP Model

Aspect of evaluation	Type of decision	Kind of question answered
Context evaluation	Planning decisions	What should we do?
Input evaluation	Structuring decisions	How should we do it?
Process evaluation	Implementing decisions	Are we doing it as planned? And if not, why not?
Product evaluation	Recycling decisions	Did it work?

Note. From "The CIPP Approach to Evaluation," by B. Robinson, 2002 [Electronic version]. Retrieved October 21, 2006, from www. Google.com/search/hub.col. org/2002/collit/att-0073/01-.

2. The integration of CIPP model in an electronic learning program

As mentioned above, the CIPP model is useful for guiding programs both for formative and summative evaluation. CIPP has the potential to shape program improvement. The present study adapts the CIPP model as an organizing framework for development and evaluation of an electronic learning program based on context, input, process, and product evaluation. Activities for integrating the CIPP model in each stage of developing the electronic learning program in this study are described:

2.1 Context evaluation focuses on the analysis of the core contents and core structure related to comprehensive midwifery knowledge, based on the

perspective of nursing students, new RNs, senior nurses, and nurse educators. The key questions were “what are the appropriate core contents for enhancing comprehensive midwifery competency?”, and “what should be the core structure of an electronic learning program?”

2.2 Input evaluation involves the set of core contents that were included into the electronic learning program. “What is the appropriate set of core contents that should be provided into the electronic learning program?” – was the key question of input evaluation. In this regard, the researcher has designed the modules of core content into the program by capitalizing on the benefits of electronic learning as purported or described in the literature, participants’ perspective, and expert validation. In addition, the feasibility of using appropriate software and the possibility of using electronic learning program materials were taken under consideration.

2.3 Process evaluation relates to implementation of the program. The key question in this regard was “Is the electronic learning program feasible?” This aspect was considering an approach to an implementation process. It was focused on the feasibility of electronic learning program utilization for nursing students. Participants’ satisfaction, weaknesses and strengths of the program were explored to determine its feasibility, or user friendliness.

2.4 Product evaluation is the assessment of program outcomes. Since learning outcome was the product evaluation in this project, “Is the program effective for enhancing comprehensive midwifery competency?” was the final key question. The program goal in this study is to increase comprehensive midwifery competency among nursing students, thus the level of core knowledge and clinical decision making are emphasized as the program outcome. After utilization of the electronic

learning program, if the nursing students' mean score of comprehensive midwifery competency in the intervention group was higher than the mean score in the control group it indicated that this program is effective. It would then be recommended that this program become integrated into nursing education. Conversely, if the mean score in the two groups was not different, or pretest scores among the intervention group were not higher than their posttest score, after learning through the program, it is likely that the program needs to be modified.

Learning theory

With a focus in psychology and education, learning theories focus on how people learn (Norton & Vandeveer, 2005), helping us understand the inherently complex process of learning. Learning theories describe the processes used to bring about changes either in the way students perform or the way in which they understand or organize elements in their environment (Norton & Vandeveer, 2005). Learning theory provides a guide for educators to choose an appropriate strategy for enhancing learning outcomes (Janekarn, 2007). Three main perspectives in learning theories were behaviorism, cognitivism, and constructivism (Mavrommatis, 2006; Mergel, 1998).

Behaviorism derives from observable changes in behavior (Mergel, 1998). Behaviorism is focused on a new behavioral pattern being repeated until it becomes automatic. Behaviorism does not interest the internal mental process. Response to stimulus can be observed quantitatively and totally ignores the possibility of thought processes occurring in the mind. The educator's role in this perspective is to arrange the environment for drawing a desired response. In behaviorism, electronic learning

focuses on repetition, sequencing, and reinforcement (Hiemstra, 2007; McMahon, 2007).

In contrast, cognitivism is focused on a thought process or mental function behind the behavior. In this view, a shift from behavioristic practices based behaviorism which emphasized external behavior to a concern with the internal mental processes of the mind and how they could be utilized in promoting effective learning was emerged (Mergel, 1998). In cognitivism, an important role of the educator is to structure the content of a learning activity that should come from a variety of sources based in part on the need of the learner (McMahon, 2007; Smith, 2005).

Both behaviorism and cognitivism are interpreted as objectivism (Mavrommatis, 2006), however, constructivism considers learning as more subjective. As a result, constructivism is more open-ended, more subject and learner-oriented, trying to facilitate knowledge construction rather than communicating knowledge (Mavrommatis, 2006; Mergel, 1998). Currently, the constructivism theory seems to be an influential theory which is widely recognized in the educational learning environment.

Constructivism views learning as a process in which the learner actively constructs or builds new ideas or concepts based upon current and past knowledge. In other words, "learning involves constructing one's own knowledge from one's own experiences”. An individual will apply his/her internalized concepts, rules, and general principles into a practical real-world context. This is also known as knowledge construction as a social process (Hiemstra, 2007; Mergel, 1998). In brief, constructivism is focused on personal acts to fulfill potential, and interaction in social

contexts. A teacher acts as a facilitator who encourages students to discover principles for themselves and to construct knowledge by working to solve realistic problems.

In conclusion, the perspectives of learning theories have been developed overtime and change a focus of learning from objective to be more subjective. In the beginning stage, theorists have focused on learners' behavior that is the most object. Later, the focus has changed to internal mental process that effect to learners' behavior on explain and interpret information. Whereas, the constructivism has focused learners on the process of learning and construction of knowledge base on their learning experiences that is more subject.

Contributions of constructivism into the electronic learning program

Currently, using the electronic learning program is accepted as a useful teaching-learning approach since it is convenient that students can open and access the course anytime from anyplace. Educators can provide a variety of learning materials and also delivery content through attractive strategies such as interactive media (Kala et al., 2009). Although, technologies in e-learning provide advanced teaching-learning approach, using only technology without regarding learning theory will not promote effective learning outcomes (Glen, 2005).

Constructivist learning theory is now one of the dominant pedagogies used in education. It encourages learners to build their own knowledge based on individual experience and apply this directly to their environment. The focus is on learning rather than teaching with the individual at the centre of a social process (Paurelle, 2003). The theory of constructivism believes that there are multiple ways of understanding knowledge and that reality is created by an individual. Knowledge

therefore becomes a personal interpretation of the interactions a person has with the world. In constructivist learning environment, teacher takes role as a facilitator who promote opportunities and events that encourage and support students for the building their understanding. The learner's role is one of constructing reality through interactions with the environment (Hiemstra, 2007).

Many advantages of using constructivism based into instructional design have been addressed, i.e., encouraging students' enjoyment, improving students' comprehension and enhancing their achievement. Students in constructivist learning environment are also facilitated in developing their social and interpersonal skills as well as collaborated learning (Kelsey, 2007; Paurelle, 2003). Thus, e-learning based on constructivism can enhance learners to seek out information, make connections and build knowledge in order to achieve their goal of learning.

In conclusion, the constructivism facilitates knowledge construction rather than knowledge transfer. The constructivism perspective was beneficial for problem-based learning and social interactivity of learning. Since the educational environment has been moved from teacher-centered to student-centered, the design and development of electronic learning programs based on a constructivist perspective is an appropriate approach. Accordingly, this study developed the electronic learning program focusing the constructivism perspective based theory in order to enhance effective learning experience.

Implication of constructivism into the electronic learning program for enhancing comprehensive midwifery competency.

As nursing practice requires that nurses continually make decisions about patients' health and response to illness, the ability to make clinical judgments involves a complex process using both domain-specific knowledge and decision making process (Botti & Reeve, 2003). The benefits of constructivism should be considered for the implication into the electronic learning program for enhancing nursing competency in nursing education. As nursing practice requires that nurses continually make decisions about patients' health and response to illness, the ability to make clinical judgments involves a complex process using both domain-specific knowledge and decision making process (Botti & Reeve, 2003). The benefits of constructivism should be considered for the implication into the electronic learning program for enhancing nursing competency in nursing education.

Constructivists' views focus on individual process of knowledge-building and individual interaction with the environment to create knowledge. Accordingly, e-learning, based on constructivism, forces learners to be actively involved in the educational process and to use creative thinking to build a knowledge base (Kelsey, 2007; Low, 2007; Woo & Reeves, 2007). While social interaction context is a considering factor influencing effective learning (Ali, Hodson-Carlton, & Ryan, 2004; Hiemstra, 2007). The quality of learning materials is considering as an important factor influencing learning outcomes (Gerjets & Hesse, 2004; Woo & Kimmick, 2000).

However, development of constructivism models in nursing for the purpose of designing effective e-learning educational experiences is lacking. Therefore, a model is proposed by the researcher based on the literature review (See Figure 2).

This model is used to organize the development and design of electronic learning program in the current study.

Designing an effective e-learning course in the model emphasizes the educator's roles on integrating e-learning based on constructivism. Nurse educators can use the model as a guideline to create effective e-learning course.

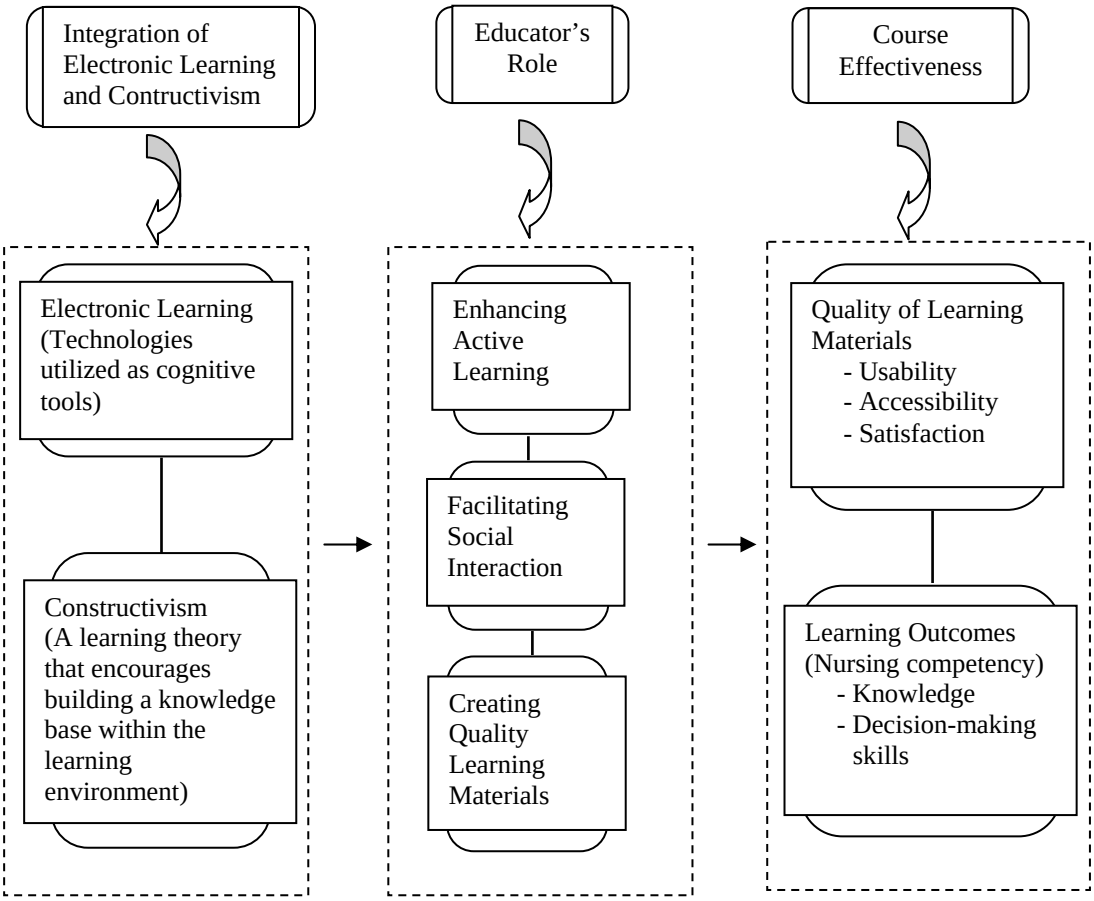

Figure 2. Electronic learning and constructivism: A model for nursing education (Kala, Isaramalia, & Pohthong, 2009).

Description of the model

1. Integrating electronic learning and constructivism

1.1 The model addresses the integration of constructivism learning theory and e-learning for the purpose of guiding teaching-learning activities.

1.2 E-learning uses technologies as cognitive tools for the purpose of assisting learners to engage in learning and to create their own knowledge base from their experiences.

1.3 Constructivism is a learning theory that encourages learners to build a knowledge base within their learning environment.

2. Educator's roles

According to constructivism theory, nurse educators have an essential role in facilitating an environment suitable for problem-solving activities and the social process of learning. Three important roles of educators for creating an effective teaching-learning environment are: 1) enhancing active learning; 2) facilitating social interaction; and, 3) creating quality learning materials.

2.1 Enhancing active learning involves facilitating learners' involvement in the teaching-learning environment. Active involvement in the learning process is crucial in order for positive learning outcomes to occur. Thus, learners in a constructivist environment need to articulate what they know, reflect on what they have learned and construct personal representations of meaning. Problem-based learning is a teaching-learning strategy that has been shown to enhance active learning (Rogal & Snider, 2008). With problem-based learning, learners' work and learn in groups in order to solve problems that address practical issues. This strategy helps create a synthesis of ideas that leads to practical solutions that are relevant to learners'

lives. For example, learners might be asked to express their ideas about how to solve a specific patient care problem. Through the use of interaction and responding to each others' ideas and questions, learners are able to improve problem-solving skills and gain new knowledge from experiences within the learning environment.

Other activities that have been shown to facilitate active learning are: case studies (Pullen, 2006); gaming (Royse & Newton, 2007); concept-mapping (Conceicao & Taylor, 2007); and simulated-based learning (Reilly & Spratt, 2007). All of these teaching-learning modalities require the learner to be actively engaged in the educational process. Case studies require intense examination, reflection and assessment of case content; while gaming requires physical and mental engagement in order to complete the process of the gaming experience. Concept-mapping involves visualizing relationships among concepts, which can develop the learners' ability to synthesize information, generate new ideas and be creative. Simulated-based learning, often involving mannequins (computerized and non-computerized), and allows learners to practice psychomotor skills, solve patient-related problems, plan nursing care and evaluate nursing care outcomes.

Online tools, i.e. quizzes and discussion boards, allow learners to interact with content and each other, as well as test their knowledge. In addition, linking to appropriate online resources allows learners to take a journey of discovery. These tools help educators to provide learners with activities that require active involvement. However, an awareness of the pitfalls to effective outcomes from the previous study such as lack of computer confidence and lack of computer materials should be acknowledged (Wilkinson, Forbes, Bloomfield, & Gee, 2004). An orientation to learning though the e-learning course should be provided for students with low

computer confidence prior to using the program. Sufficient computer materials and computer networks should be available.

2.2 Facilitating social interaction involves creating and supporting opportunities to learn from one another, as well as from the experiences within the environment. Constructivists believe social situations enhance effective learning. Meaningful social interactions can be created within an e-learning environment. There are several synchronous and asynchronous modes of facilitating meaningful social interactions within an e-learning environment which include: e-mail, online discussion boards, blogs, podcasting, online videos, MP3 players, iPhones, and virtual communities. E-mail, discussion boards and virtual communities enable learners to share ideas, pose questions to one another, collaborate on problem-solving, create new perspectives and gain new knowledge. Woo and Kimmick (2000) indicated that most learners face difficulty with these technologies because they are time consuming on interaction throughout the e- learning course. It is the nurse educators' decision regarding which technological innovations to use in e-learning. The institution must have sufficient resources available to the nurse educator. These resources include: network cabling, computer labs and support systems. They all are important for the selection of suitable technologies for effective e-learning environments preventing difficulty to students. Consequently, the selection of technological innovations and resources needs to be based on appropriateness for supporting appropriate e-learning interaction.

2.3 Creating quality learning materials involves designing content and multimedia components in regards to the learners' perceptual knowledge. For example, the educator would not design content and multimedia components in the

same manner for both a second year and fourth year learner. Learning materials need to be designed in such a manner that content and multimedia components increase in breadth and depth, as the learner progresses within the academic program. Some materials are reported as too descriptive and lack of human contact (Wilkinson et al., 2004). Nurse educators need to consider a design of learning materials that are more attractive; i.e. interactive media more than a pack of prescriptive content. Appropriateness of learning materials should be evaluated, prior to implementation in the real course. A high quality of learning materials enhances learning outcomes, and also learners' satisfaction.

In addition, designing learning materials should involve a thorough assessment of the actual content being presented, as well as the techniques to be used within the e-learning environment. For example, a formative evaluation should be carried out to assess content validity and the technical format of each e-learning activity. Then a summative evaluation of the course effectiveness and learning outcomes should take place.

3. Course effectiveness

Course effectiveness is an important component of the interface between e-learning and the use of constructivism within nursing education. Course effectiveness entails assessment of e-learning experiences and involves the use of two types of evaluation processes: 1) quality of the learning materials; and, 2) learning outcomes.

3.1 The quality of learning materials addresses the effectiveness and appropriateness of the e-learning technologies used. In other words, did the learners find the technologies used to be: accessible, easy to use, appropriate, informative and

helpful? If the answer is “no” to any of these aspects of assessment, then revisions are in order.

3.2 Evaluation of learning outcomes addresses the educational goals and learners’ achievements related to the e-learning experiences. Outcome assessment needs to include, but not be limited to, competency in: problem-solving, decision-making, carrying out psycho-motor skills and understanding nursing knowledge.

The electronic learning program in this study is developed by providing an emphasis on multiple ways of learning based on constructivism to see how people learn. Moodle is a learning management system which is rich with useful features that can enhance effective learning experience and is used as the tool of the supplementary course.

In addition, the instructional design concept of Janicki and Steinberg (2003) is modified and combined to design the structure within each of the learning modules in the electronic learning program. This concept is developed using multiple presentation styles into the learning module. Janicki and Steinberg (2003) stated that this concept is modified from many theorists’ perspectives such as the instructional design activities, the event of instruction, and the strategies of instructional design.

Constructivism places emphasis on multiple ways of learning which encourages learners to build their own knowledge through experience of the learning environment. Its focus is on learning rather than teaching with the individual at the center of a social process. The learning environment based on constructivism has been emphasized on enhancing active learning which provides rich resources of learning and design materials for flexibility regarding several styles of learning and facilitates social interaction which organizes flexible online communication among learners, as

well as, feedback, goal-oriented, and self-controlled learning (Low, 2007; Gerjets & Hesse, 2004; Paurelle, 2003). The “instructional design concept” of Janicki and Steinberg is suitable to the constructivism approach for effective learning. Thus, researcher has modified the instructional design concepts of Janicki and Steinberg for structuring the entire modules within each unit of the electronic learning program. Figure 3 presents a model of structuring the entire modules of the electronic learning program in this study.

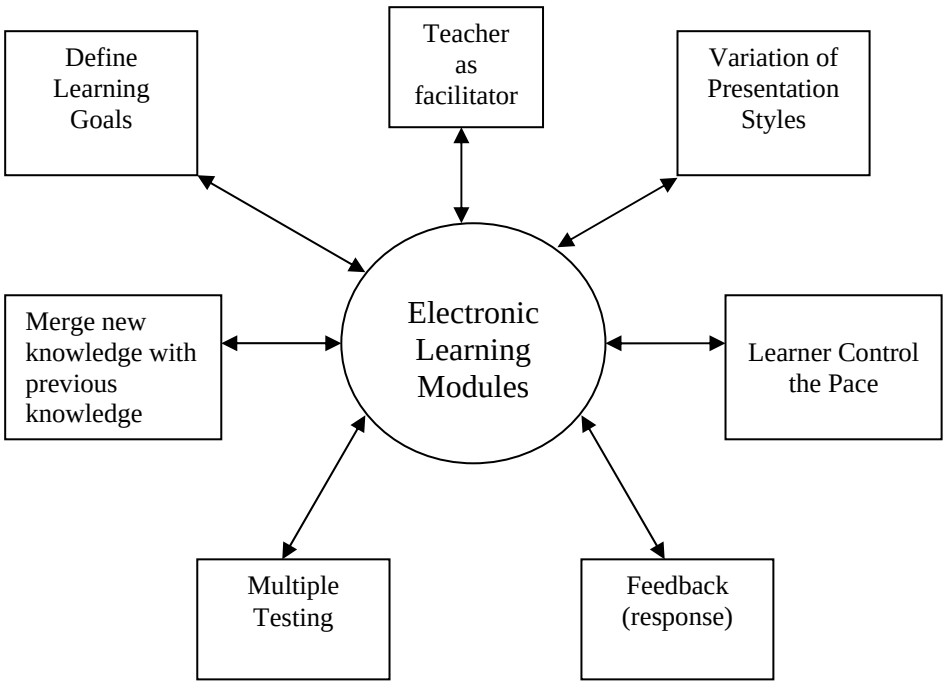

Figure 3. Structured strategies of electronic learning modules modified from the instructional design concept (Janicki & Steinberg, 2003).

The details of strategies in figure 3 will be clarified as follows:

Teacher as facilitator. Viewing teacher as facilitator is meaningful. This view is a move from a teacher-centered to student-centered; student has to be active more than passive by deciding the approach of his or her learning. Thus, the teacher's role for designing electronic learning programs regarding constructivism is emphasized on enhancing active learning which provides rich resources of learning and design materials for flexibility regarding several style of learning, as well as facilitating social interaction which organizes flexible online communication among learners both using synchronous and asynchronous interaction.

Define learning goals. Indicating learning objectives provides a road map for the electronic learning program. In this study, specific learning objectives of six modules were provided to guide students' learning experience.

Variation of presentation styles. It points to presentation of the information in a variety styles. The effective approaches for facilitating learning are addressed, i.e., lesson content, an example, extended resource and an exercise. This perspective emphasizes that an individualist approach is important to learning.

Merge new knowledge with previous knowledge. Indicating new knowledge can be learned when it is synthesized from prior information gained. Thus, the electronic learning program will put the prerequisite knowledge that would be helpful for the learner to acquire before learning the current lesson.

Multiple testing. Specifying the development of the electronic learning program considering different learning styles. The electronic learning program will provide multiple techniques of testing such as true/false and multiple-choice.

Feedback. It provides comments to learners when they complete the quizzes and gives them their scores. The feedback provides reasons for their wrong answers, and links back to the information presented in the module.

Learner control the pace. It emphasizes the important of providing the learner self-control and direction through the lesson. The electronic learning program will provide the different paths to access the program; it facilitates the students to choose direction for their learning. For example, students can learn by reviewing the lesson, and/or by doing the exercise.

In summary, the model of e-learning design based on constructivism in nursing education is a guideline of developing an electronic learning program for enhancing comprehensive midwifery competency. The seven strategies of the instructional design were used to structure the entire electronic learning modules of this study. In addition, the Moodle software is used as a platform for delivering the learning experience through an electronic learning course. These strategies are combining design by emphasizing the constructivism base and utilize it into the electronic learning program for enhancing comprehensive midwifery competency among nursing students.

Comprehensive midwifery competency

Nowadays, knowledge and decision-making skills are recognized as essential competencies for practitioners who are taking effective responsibility in their practice (Haggerty & Nuttall, 2000; Hendry & Walker, 2004; Shin, 1998). Nursing practice requires that nurses continually make decisions about patients' health and response to illness. The ability to make clinical judgments involves a complex process using both

domain-specific knowledge and the decision making process (Botti, 2003). Bradshaw (1997) stated that competency would be assessed through learning outcomes. Thus, knowledge and clinical decision making skills are important abilities to perform comprehensive nursing competencies that are safe and effective for professional practice, and that can be assessed through learning outcomes.

Registered nurses (RNs) who have been educated at a baccalaureate level are considered to be well- prepared to work in the present health care system that focuses on the quality of patient care. As a result, the Thailand Nursing and Midwifery Council established the examination for graduate nurses to assure their competency as practitioners in the healthcare system. This institution has specified that all graduating nurses must pass this examination before becoming licensed as legal nurses. The examination covers six areas and is administered three times a year. As a result, the students must pass each individual section, and renew their licenses every 5 years (Ander & Kunaviktikul, 1999; International Affairs Subcommittee, 1997).

With concern for the qualification of nurses, a national nursing competency standard is identified from Thailand Nursing and Midwifery Council (TNMC, 2007). This institution has defined fourteen of the core nursing competencies for a Registered Nurse including to provide: 1) a standard nursing practice regarding holistic nursing care, 2) a standard nursing practice of midwifery in prenatal care, intrapartum care and post partum care, 3) a promotion of health care, 4) a prevention of diseases and immunization enhancement, 5) a rehabilitation of health regarding physical, psychological and social, 6) a primary medical care, 7) an educating and consulting for person, family, and community, 8) an effective communication with person, family, and community, 9) a representation of a good leadership, 10) a nursing

practice regarding human rights, 11) a concern on the value of developing nursing research, 12) a use of information technology to support nursing practice, 13) a regard on continuing study for enhancing nursing competency, and 14) a collaboration for professional development and nursing authority.

As mentioned previously, midwifery is one of core nursing competencies identified by the TNMC. In order to enhance midwifery competency for students, a regulation for midwifery practices is considered.

Midwifery practice is defined as the nursing responsibility for pregnant women, post-partum mothers and newborns, including physician assistances in midwifery care. The midwifery practices in which regulated by the TNMC (2007) are compost of four aspects as follows.

1. Educating, advising, consulting, and problem-solving on midwifery care

2. Activities that deal with physical and mental health of pregnant woman, post-partum mother and newborn in order to prevent abnormalities during antepartum, intrapartum and postpartum periods.

3. Examination for women and newborn, birth assisting, and family planning

4. Activities that provide to assist a physician for the care of women and newborns.

In addition, The TNMC has identified scope of core knowledge content leading to the development of midwifery competency that need to be used as blueprint for four-year nursing program in all nursing schools of Thailand (TNMC, 2006). The standardized core contents are outlined as follows.

1. Midwifery' roles: The role of midwifery regulated by the Thai law and specified by WHO

2. Principle of labor: Definition of labor and stages of labor, principle of labor onset, factors related to labor and delivery, and mechanism of labor

3. Nursing care during first stage of labor: Admission to the labor units and labor assessment, and enhancing of labor progression

4. Nursing care during the second, third, and forth stages of labor: Nursing care for woman in the second stage, normal labor, placenta delivery, episiotomy and repair of vagina, and early postpartum care

5. Nursing care for newborn: Early newborn assessment and care

6. Fetal assessment for high risk pregnancy: Biochemical assessment, biophysical assessment, and electronic fetal monitor

7. Drugs administration during labor and delivery: Drugs for increase uterine contraction and for pain relief

8. Nursing care for high risk pregnant women: Fetal anomalies, dead fetus, elderly gravida, teenage pregnancy, unwanted pregnancy, drug addicted pregnancy, and abuse during pregnancy

9. Nursing care for pregnant women with complication: Hyperemesis gravidarum, Pregnancy induced hypertension, hydramnios/oligohydramnios, twins

10. Nursing care for pregnant women with medical and surgery diseases: Heart diseases, diabetes mellitus, blood dysfunction, urinary tract infection, thyroid dysfunction, and asthma

11. Nursing care for pregnant women with hemorrhage: Abortion, molar pregnancy, ectopic pregnancy, abruption pregnancy, and placenta previa

12. Nursing care for pregnant women with infected disease: Hepatitis, rubella, syphilis, herpes, condyloma accuminata/HPV

13. Nursing care for pregnant women with abnormality of factors affecting labor: Power, passage, passenger, psyche and position

14. Nursing care for pregnant women with complication during labor and delivery: Premature ruptured of membrane, preterm/posterm, intra uterine growth retardation, amniotic fluid embolism, vasa previa, prolapsed cord, fetal distress, post partum hemorrhage, retained placenta, uterine ruptured and obstetric shock.

15. Nursing care for pregnant women receiving assisting of labor: Induction of labor forceps extraction, vacuum extraction, caesarean section, version, placental removing, emergency birth and breech assisting

16. Nursing care for postpartum women with complication: Hematoma, subinvolution, infection, phlebitis, breast abscess, postpartum depression and psychosis

17. Nursing care for newborn with complication: Birth asphyxia and cardio pulmonary resuscitation and birth injuries.

The midwifery practices and the scope of core content of midwifery have been identified as a standard for the preparation of the registered nurse to be a competent practitioner. Accordingly, those specifications were used as the competent criterion standard to guide the development of the core content for comprehensive midwifery competency in the e-learning program of the present study. Moreover, scope of core content from TNMC was used to generate the structure of content for comprehensive midwifery competency.

Having strong knowledge and decision making skills in the midwifery field will affect the graduate not only in getting a license but also in assuring that all new nurses are able to practice to the best of their ability in the nursing profession. Thus,

teaching nursing students to be competent practitioners is important and challenging to midwifery nurse educators.

Program development

In order to develop learning modules for enhancing midwifery competency, a process of program development was conducted from literature reviews of educational intervention program (Alewijnse et al., 2002; Van Berlo et al., 2007; Escoffery et al., 2004). As a result, the process of developing the e-learning program composed of six steps as follows.

1. Needs assessment. This step aimed to identify learning needs of comprehensive midwifery competency (CMC) relating to knowledge and clinical decision making skills

2. Specifying CMC domains and structuring learning modules. The needs of CMC were summarized into categories of learning modules. Then the core contents of each learning module were created in order to provide an e-learning program.

3. Designing e-learning program. This step is aimed to create the electronic learning program. The learning modules were structured into the electronic learning program based on constructivist learning environment.

4. Determining content validity and program appropriateness. This step aimed to indicate the validity of core contents of learning modules and verify functional system of e-learning program in order to assure quality of learning materials.

5. Pilot testing. It is a try out to identify potential problems and feasibility of the preliminary e-learning program.

6. Program implementation and evaluation. This step is aimed to determine electronic learning program during the implementation process in terms of feasibility and effectiveness.

Reliability, validity and feasibility of program development in the study

Gillis and Jackson (2002) purported that measurement is the process of linking abstract concepts to their empirical indicators. This study will use three concepts of measurement to indicate properties of the learning modules in the e-learning program including validity, reliability and feasibility.

1. Validity. Validity was defined as the extent to which a measure reflects a concept. It determines the congruence of concept and the indicator. When the instrument is considered valid, it measures the concept it was intended to measure. There are five types of validity: face, content, concurrent, predictive, and construct. An instrument may be judged to possess one, all, or any combination of these types of validity (Gillis & Jackson, 2002).

1.1 Face validity. The instrument appears to reflect the construct that it is intended to measure. It can be tested by expert opinion, using a panel of experts to determine if the tool measures what it is intended to measure 4 (Gillis & Jackson, 2002). Differently, another aspect identifies face validity as reflecting the extent to which the test taker or someone else who is not an expert (Nunnally & Bernstein, 1994; Waltz, Stickland, & Lenz, 2005).

1.2 Content validity. The instrument items reflect the full range of the attributes of the concept being measured. It can be verified by other evidence such as a literature review to determine what content should be included. Moreover, it can be judged by the use of a panel of experts on scope and representativeness of content, as

well as, use of study's theoretical framework to support the content validity of the tool (Gillis & Jackson, 2002; Ewen, 1993 cited by Gillis & Jackson, 2002). When an instrument is considered valid, it measures the concept it was intended to measure. This type of validity is valuable, especially, in a developing instrument to measure specific knowledge. Content validity index (CVI) is often used to estimate content validity of items. It is computed by using ratings of item relevance by content experts on a four-point scale. It is calculated from the proportion of judges rating the items of 3 and 4 points. Value of CVI > .8 is acceptable (Dempsey & Dempsey, 2000; Waltz et al., 2005).

1.3 Criterion validity. There are two kinds of criterion validity; concurrent and predictive. Concurrent validity refers to the correlation of one measure with another measure of the same phenomenon. It can be tested by comparing the test instrument with another instrument that measures the same concept and is known to be valid. Predictive validity refers to an accuracy of the instrument to predict a phenomenon. For example, GPAs can predict NCLEX success rate. It can be tested by using the instrument in a study and then comparing the results with a future outcome (Gillis & Jackson, 2002).

1.4 Construct validity. The construct validity is directly concerned with the theoretical relationship of a variable such as a score on some scale (DeVellis, 1991). Similarly, construct validity is recognized as it is based on inductive evidence, or deductive evidence. If the measure finds evidence to support a theoretically derived hypothesis, or a theoretically derived hypothesis turns out as predicted, then it would indicate that one's measures have construct validity (Gillis & Jackson, 2002). It is tested by several approaches including hypothesis testing, convergent and divergent,

contrasted group, multitrait-multi method, factor analysis, and causal modeling (Ewen, 1993 cited by Gillis & Jackson, 2002).The hypothesis testing approach refers to the investigator using the theory or conceptual framework underlying the measure's design to state hypothesis regarding the behavior of individuals with varying score on the measure, gathering data to test the hypothesis, and making inferences on the basis of findings regarding whether or not the rationale under the instrument's construction is adequate to explain the data collected (Waltz et al., 2005).

To determine validity of the electronic learning program in this study, content validity-expert judgment and face validity-user reflection were used in defining an appropriateness of its core contents and components.

2. Reliability. Reliability refers to the extent to which, on repeated measures, an indicator will yield similar results. Four terms; dependability, consistency, stability, and accuracy are referred to reliability and often used interchangeably. The first three terms refer to the instrument's ability to produce the same results on repeated measures. The fourth term, accuracy, refers to the measurement tool's ability to reflect the true value being measured. These are three attributes of reliability that should be considered in the assessment of an instrument in quantitative method (Gillis & Jackson, 2002; Waltz et al., 2005).

2.1 Stability is concerned with the consistency of results with repeated measures. Test-retest procedure and parallel form are used to determine stability. A good correlation suggests good test-retest and parallel from of reliability.

2.2 Internal consistency refers to the ability of the items in an instrument to measure the same variable. Homogeneity is often used to refer to the internal consistency of an instrument. Four methods are available to test the internal

consistency; Kuder-richardson (KR 20, KR 21) coefficient, item-total correlations, split-half reliability, and Cronbach's alpha. Kuder-richardson coefficient is used with instruments that have a dichotomous response format (yes/no). Item-total correlations- the correlation between each item and the total scale, uncorrected item-total scale correlation above 0.25 are acceptable. Cronbach's alpha is used measure reliability based on the strength of the internal correlations of all the items in the instrument as well as the number of all the items.

In this study, Split-half reliability is used to calculate the CMC reliability. In this approach, the items comprising a test or scale are spited into two groups (usually, odd versus even items) and scored, and then scores on the two half-tests are used to compute a reliability coefficient. If the two half-tests are really measuring the same attribute, the reliability coefficient will be high. Next the Spearman-Brown formula is used to calculate the reliability coefficient of the whole test items (Polit, Beck, & Hungler, 2001).

To calculate the CMC reliability in this study, the Split-half method was firstly used to determine its reliability for a half of CMC items. Then Spearman-Brown formula was used to calculate for the reliability of the total CMC items.

2.3 Equivalency refers to the degree of agreement among two or more different observations using the same measurement tool; inter-rater reliability or the agreement between two or more alternate form of an instrument. Equivalence for parallel versions of an instrument is determined by correlating the two scores with each other. Values above 0.80 are usually taken as evidence that the forms may be used interchangeably and an intraclass statistic is used to determine equivalency (Waltz et al., 2005).

In this study, agreement of three experts determining the appropriateness of the electronic learning program was used to evaluate equivalency of the program.

3. Feasibility. Feasibility indicates the capability of what is being executed. It is a criterion that presents a utilitarian view. It should be used to assess and acknowledge the limits imposed by current technology. Practical considerations of feasibility may be measured such as; age, language, culture, cognitive status, and strength of subjects (Waltz et al., 2005). Feasibility in this study was focused on the satisfaction of nursing students using the electronic learning program. In addition, limitations of the program were explored. Satisfaction of electronic learning program was developed from the literature review and used to collect data for feasibility determination.

Existing Knowledge of Electronic Learning Program in Nursing Education

This point of view addresses the existing knowledge related to principles of the electronic learning program and researches development based on electronic learning programs in nursing education.

Definition of electronic learning.

Glen (2005) stated that electronic learning (e-learning) is an integrating information technology into the learning/teaching process, using material delivered via internet. While, other points of view described that electronic learning is emerging as the paradigm of modern education. It refers to using electronic applications and processes to learn. Content is delivered via the internet, intranet/extranet, audio or videotape, satellite TV, and CD-ROM. Thus, it is education via the internet, network, or stand alone computer (Sun, Tsai, Finger, Chen, & Yeh, 2008). Similarly, electronic

learning was defined as the acquisition of knowledge and skill using electronic technologies such as computer- and internet-based courseware and local and wide area networks (Encatar, 2006). Electronic learning is also called e-learning, web-based learning, computer-based learning, virtual classrooms, online learning, computer-based instruction, interactive learning, web training, and web-based education (Agelesslearner, 2007; Bitpipe, 2007; Linezine, 2007).

Electronic learning programs may be defined as the use of telecommunication technology based on standalone computer or the internet to deliver information for education and training.

This study is focused on utilizing Moodle software as a learning management system to organize the learning experience through web-based education. The principle of Moodle software is defined as follow (Moodle, 2008):

Moodle is a popular open source course management system (CMS). It is also known as learning management system (LMS) or a Virtual learning environment (VLE). Educators around the world have recognized it as an appropriate tool for building online courses for their students. A web server needs to be installed on one's own computer or one at a web hosting company before using this software. A feature of Moodle facilitates educators in many ways to create learning experience for their students:

Moodle provide an operation of a large number of students. It can use to conduct fully online courses or blended learning courses; supplement face-to-face courses. Educators are allowed to build richly collaborative communities through the use of many activity modules based on constructivism; such as Forums, Wikis, Databases and so on. It's' features also make available for educators to deliver content

to students and assess students' learning using assignments or quizzes. Moodle is constructed under considering constructivism philosophy.

The design and development of Moodle is lead by constructivism beliefs. Constructivism thinks people actively construct new knowledge as they interact with their environments. Through social interaction learners are facilitated to construct knowledge for one another. Discussions and activities in Moodle enhance students' achievement towards the learning goals of the class.

Characteristics of electronic learning program

The role of information and communication technology in educational development has been recognized world-wide as a priority in order to reinforce academic development, to widen access, to attain universal scope and to extend knowledge, as well as to facilitate education throughout life (Cantoni, Cellario, & Porta, 2004). There are several points of view guiding principles of utilizing electronic learning for effective learning in education.

The use of e-learning is identified that it might be provided to engage the students in active exploration, enhance the craft of teaching and learning by stimulating the multiple ways of knowing, and enhance the ways students learn by using technologies (MacAllister & Mitchell, 2002).

In addition, the considerations of using e-learning were specified: 1) principles for including media elements, 2) principles for creating online practice exercises, and 3) principles for online collaboration (Clark & Mayer, 2003). The details of this point of view are explained as the following.

1. Principles for including media elements. In this aspect, six features should be considered: 1) multimedia, use words and graphics rather than words alone; 2) contiguity, place corresponding words and graphics near each other; 3) modality, present words as audio narration rather than onscreen text; 4) redundancy, present words in both text and audio narration can hurt learning; 5) coherence, adding interesting material can hurt learning-avoid extraneous material and verbosity; and 6) personalization, use conversational style and virtual coaches.

2. Principles for creating online practice exercises. Several features were considered for creating an online exercise, for example train learners to self-question during receptive e-lessons, replace some practice problems with worked examples, teach learners to self-explain examples.

3. Principles for online collaboration. To create effective collaboration educators need to make assignments that require collaboration among learners, assign learners to groups in ways that optimize interaction, structure group assignments around products or processes, and provide models for structured collaboration such as jigsaw, structured controversy, problem-based learning, and peer tutoring.

A number of approaches for well designed e-learning programs for health professionals and students were suggested such as learner centric, shared responsibility between trainers and learners, piloting of courses and on-going evaluation, relevant content, and logically organized content. Designing a variety of methods for knowledge delivery and ease of use with logical navigation were identified as the crucial component as well as promoting interactive learning (Childs, Blenkinsopp, & Walton, 2005).

From the literature review, there are a variety of principles for designing an electronic learning program for effective learning. To integrate the principles of electronic learning into nursing education, besides emphasis on available resources, goals setting of each program, the educator and designer should be concerned with the principles of electronic learning. Designing the content and construct of electronic learning programs based on its principles will help individual nurses build knowledge and skills as a competent professional nurse.

Advantages and disadvantages of e-learning program.

Advantages. Several advantages of electronic learning integration in education are identified. E-learning has specified its benefits in education in terms of enabling truly flexible learning, in which students access educational resources regardless of time or location. It provides access to a wealth of human knowledge and experience, especially, from an internet connection. The E-learning approach allows quick, easy and relatively cheap sharing of information and ideas with people across the world. It is also providing unique advantages over other modes of education delivery because educators can combine text, images, video and sound into multimedia rich, and interactive learning experiences (Adam, 2004).

In addition, e-learning is self-paced and it can be taken and repeated when necessary. It provides consistent content that students can learn from anywhere at any time. Through e-learning, educators can update their course easily and quickly. Within the e-learning course, large groups of students can be managed (Cantoni, Cellario & Porta, 2004).

The e-learning method can also create many learning activities. Creating interaction that engages the students' attention through games, and quizzes is a crucial

activity. In the e-learning environment, communication among learners and educators is promoted through synchronous and asynchronous methods such as; chat rooms, discussion boards, instant messaging and e-mail. All activities offer students for effective e-learning experience (Sargeant, Currn, Allen, Jarvia-Selinger, & Ho, 2006; Woo & Reeves, 2007).

Disadvantages. Some disadvantages of e-learning are the factors that educators should be aware of in creating the e-learning program in education. It may cost more to develop, it requires new skills in content producers, and still has to clearly demonstrate a return on investment. Additionally, related technology may be confusing or simply frustrating, especially, in students with low computer confidences. Some students might be faced with a lacking part of the informal social interaction and face-to-face contact of traditional classroom training. Moreover, e-learning requires more responsibility and self-discipline for the learner to keep up with a more free and unconstrained learning process and schedule (Cantoni, Cellario, & Porta, 2004; Wilkinson et al., 2004; Woo & Kimmick; 2000).

In conclusion, there are various advantages of integrating electronic learning in education that brings effective learning outcomes. However, disadvantages of the electronic learning program will affect difficulty to achieve success in the learning program. The disadvantages can be overcome with a well-designed program with good content, good construct, and preparation for learners' activity in using the program. This will increase effectiveness and efficiency into the learning program.

Empirical Studies of Electronic Learning Program in Nursing Education

Nursing education worldwide is preparing graduates for comprehensive practice. Comprehensive nursing competency is knowledge and clinical decision making skills required for registered nurses, in order to provide safe and effective nursing care. As a result, comprehensive nursing competency is an essential ability for nurses' clinical practice. As the benefits of electronic learning programs have been widely recognized, many research studies related to electronic learning programs and comprehensive nursing competency have been established worldwide. Research studies developed of electronic learning programs in nursing education are reviewed as the following.

1. The number of e-learning programs that have been developed in nursing education, in Thailand. These e-learning programs that were developed were stand alone computer packages. In one study there is an instructional videos package (Kala, Youngwanichsate, & Chunuan, 2008). The others are computer assisted instructions-CAI (Lertpoonwilaikul, Limkosit, Viseskul, Pramoch, Ratdilokpanich, & Laohajaratsang, 2005; Kusum, 2002; Singchangchai, Sangkharak, & Noonkaew, 2004; Viseskul, Aree, & Tuntisirintra, 2002). From the review, nursing competency studies frequently focused on knowledge and practical skills.

2. Regarding the effect of CAI on improving knowledge, a study of CAI-nursing care effecting cerebral vascular accident patients was conducted to compare achievement of nursing students (Kusum, 2002). The findings indicated that there was a statistically significant difference on knowledge between a group of nursing students who were taught by CAI and a group by traditional instruction. There was no effect of CAI on knowledge of low GPA students.

3. Considering the impact of e-learning on nursing knowledge and skills, a study by Viseskul and colleagues (2002) was developed using CAI regarding nasogastric feeding (CAI-RNF). The results indicated that the knowledge of nursing students after receiving the CAI-RNF teaching was significantly higher than before the teaching. Additionally, students' knowledge and practical skills of nursing students in the experimental group were significantly higher than the control group.

The findings were somewhat in line with the instructional videos package that were conducted to evaluate the students' obstetric nursing knowledge and skills of using the program among 104 third year nursing students in undergraduate program (Kala et. al., 2008). The result found that the post test obstetric nursing knowledge of the experimental group was statistically higher than that of the control group that was taught by conventional lecturing methods. However, the results showed that the use of the video made little impact on developing nursing skills. The report described that this might be because the students only watched the video once before they undertook clinical practice. Similarly, a study was conducted to study effects of CAI regarding urinary catheterization on knowledge and practice of nursing students (Lertpoonwilaikul et al., 2005). The results showed that after using the CAI, the intervention group had significantly higher knowledge than the control group. However, there was no effect of the program on the practical skills. The researchers stated that the no effect of CAI on practice may be because the students had less desire to practice this skill since no actual score was provided for this skill.

Furthermore, a study was conducted regarding improving students' knowledge while assessing students' satisfaction of the CAI-research program (Singchangchai et al., 2004). In this study, the lesson on how to write a proposal for a health research

project was conducted. The subjects were 30 first-year graduate students of the faculty of nursing. The result showed that the effectiveness of the lesson was good. Students had higher average pre-test scores than their post-test scores. In addition, subjects indicated a high satisfaction of CAI lessons.

In summary, almost all of the research studies in Thailand emphasized the effectiveness of electronic learning programs in nursing education. From the literature, nursing competency studies frequently focused on knowledge and practical skills. None focused on competency regarding clinical decision making skills. Although e-learning programs and comprehensive nursing competency have been integrated for effective learning in nursing education and have reported positive outcomes, the technology to date, seems to be only stand alone computer packages. None of them were developed under a kind of web-based learning program. Moreover, almost all programs were focused on one learning topic or procedure in a clinical area and the way of structuring the programs was directly constructed from the instructors' perspective.

In regards to the international research literature related to electronic learning programs, it can be categorized into 3 groups based on aims of the studies: 1) evaluating program successfulness, 2) determining program satisfaction, and 3) developing the tool for program evaluation (Chang, Sheen, Chang & Lee, 2008; Huckstadt & Hayes, 2005; Melrose, 2006; Tsai & Chai, 2005).

Different than to national studies, the international research studies employed both technologies - stand alone computers and the internet to integrate learning in nursing education. The designs were similar to national studies in term of comparative studies, between two learning approaches; via electronic learning program and

traditional methods, and used pre-test and post-test designs. Additionally, some studies were qualitative (Kenny, 2002; Melrose, 2006).

Three characteristics of previous studies' results were; 1) positive outcomes, 2) negative outcomes, and 3) gaps of knowledge of using e-learning program. These are summarized below.

Positive outcomes: Online learning reports show that positive learning outcomes focus on learner's knowledge and skills, and program satisfaction focuses on perception of users. Huckstadt and Hayes (2005) evaluated the interactive courses for Advanced Practice Nurse-APNs. Their result indicated significance between the pre-test and post-test knowledge scores taken at the completion of the online portion of two modules: back pain and dermatology. The findings consistent with the evaluation study of online continuing professional education course conducted by Pullen (2006). In the course, all participants received course instructions, learning objectives, content coverage, together with online discussion board. The finding indicated that learning online was the effective approach that enables to increase their knowledge. The result was also supported by another study (Sung, Kwon, & Ryu, 2008) that revealed a significantly higher level of knowledge in the intervention group learning through a blend of learning when compared to the knowledge of the control group that learning through the traditional classroom. The researchers claimed that a blended learning is useful for enhancing professional knowledge. They also suggested that an e-learning program can reduce the lecturing time and course of repeated topics and it can also be an effective component in nursing educational program.

Focusing on program satisfaction, participants evaluated the programs as innovative, time saving, convenient, available, and economical (Huckstadt & Hayes,

2005). In post-registration nurses, learners enjoyed the program's flexibility, having control over where and when they learned, and liked the quality of the learning materials (Wilkinson et al., 2004). Similarly, the findings from individual interviews and focus groups regarding nursing students' experiences with health informatics online learning course, showed four major themes: computer confidence, flexibility, active learning, and practicalities of teaching (Kenny, 2002). Learners indicated the content and process for the course was useful and beneficial to their work. The online course of teaching with technology empowered nurse educators with knowledge and confidence both to use technology and teach with technology (Bonnel, Wambach, & Connors, 2005). In the epidemiology course for RN to BSN program, students indicated that online learning was more flexible, stimulating, and creative than a traditional class (Suen, 2005). The result showed that the course web-site was accessed 600 times by 50 students during a 14- week semester. Students noted they were able to proceed at their own pace and in their own time, download teaching materials, and repeat learning through modules as many times as needed. Additionally, students in graduate study programs indicated that online learning facilitated help-seeking interaction among learners (Melrose, 2006). The results were consistent with the recent study of a meta-analysis in Taiwan (Liao, 2007). From fifty-two research studies, the results suggested that CAI is a more effective teaching-learning method.

Negative outcomes: Some negative outcomes were addressed from using electronic learning courses. Though students perceived the benefit of using electronic learning, they responded negatively to the lack of human contact, computer problems, a lack of printed material, and to materials that were too prescriptive (Wilkinson et al.,

2004). These findings were somewhat in line with another study (Heriot, Bishop, Kelly, Murphy, & Truby, 2003), where students reported that CAI is flexible and that they can repeat sections and identified that it should be used as an additional aid to lecture. However, they reported a lack of social contact with peer support as a disadvantage. Discussion online was noted as time consuming and difficult (Woo & Kimmick, 2000). Surprisingly, more than 70% of RN to BSN students in a nursing leadership course indicated they would prefer a face-to-face course over an on-line course (Brown et al., 2003).

Gaps of knowledge: A review of 25 evaluation reports of nursing education using electronic learning compared with traditional instruction showed inconsistent results; effective, not effective, or no change (Lewis et al., 2005). The researchers mentioned that a consistent result might depend on the quality of the electronic learning program, because the earliest packages used text only. Similarly, Chang and colleagues (2008) developed e-learning program for improving knowledge and skills for staff nurses in Taiwan. The finding found that there were no statistical differences between the two groups of 3 learning courses, while the lecture group had significantly higher scores in the other two learning courses than the e-learning group. The researchers gave reason that the two courses might require more instructor-learners interaction due to questions and immediate answers. The scores were higher in the lecture group than those of the e-learning group because they could discuss issues with the instructor in class. The researchers suggested that providing online discussion in future e-learning programs may reduce this limitation.

Furthermore, the findings were consistent to Jacobsen (2006), who found no difference between the students' experiences of the online discussions and those of

the students participating in traditional group discussions among undergraduate students. A limitation was reported that some students had limited computer confidence. In the same way, Woo and Kimmick (2000) indicated that there were no significant differences of student satisfaction scores in a nursing research course via the internet and via traditional lecture instruction. The researchers mentioned the lack of validity and reliability of an instrument used in the study, and having a cross-over attendance of graduate students in two groups.

Some studies reported that teaching-learning in the classroom were more successful than in e-learning class (Reime, Harris, Aksnes, & Mikkelsen, 2008; Jang, Hwang, Park, Kim, & Kim, 2005). A study focused on teaching nursing students infection control (Reime et al., 2008) revealing that through e-learning participants perceive the e-learning program as a good resource; well designed with a motivated test program, the lecture group had a higher sum score on the knowledge test. The researchers indicated that some topics of outline course were not included in e-learning and that this was a possible reason students got lower scores than the lecture group. Similarly, the findings of Jang and colleagues (2005) found that after 4 weeks of learning the web-based group had significantly lower knowledge scores than those of students in the control group that used face-to-face lecture. The researchers have suggested that the teaching method is not easily influencing students' knowledge but web-based teaching materials may influence their knowledge building. They also mentioned that 1 hour of orientation may not be enough to motivate students in using online courses.

Almost all results indicated positive learning outcomes of integrating electronic learning into nursing education. However, there are three possible factors

considered as the source of an effective learning experience. Firstly, computer confidence seems to be one of the influential factors. The suggestion is proposed that a learning approach should be developed by the faculty for students to be proficient on computer skills before using electronic learning programs. Secondly, reliability and validity of an evaluation instrument should be identified before use in evaluation of an electronic learning program. Finally, the quality of learning course is mentioned as its affect to course effectiveness. In this regard, a lack of quality of an electronic learning course is a major concern. Additionally, a lack of social contact with peer and peer-group support was a disadvantage factor that should be considered by instructional educators and designers. These factors might affect the result of program disadvantages and learning outcomes. Accordingly, designing electronic learning based on learning theory will enhance the course quality, reduce course disadvantages, as well as enhance course effectiveness (Glen, 2005).

Summary

The literature review indicates that the quality of individual nurses is an important issue considering a public requirement and quality nursing care. Thus, educators and schools of nursing have a challenging role of teaching and training individual nursing students to be knowledgeable nurses. As the electronic learning program has been recognized as beneficial for effective learning in nursing education, the researcher has been interested in developing an electronic learning program for enhancing comprehensive midwifery competency. The four perspectives composed of CIPP model, learning theory regarding constructivism, concept of comprehensive

midwifery competency, and instrumentation are integrated together for conducting the electronic learning program.

In order to create a new approach for enhancing comprehensive midwifery competency, the current study emphasized developing content covering midwifery competency into an electronic learning program as a new supplemental instruction for nursing education. The program feasibility and effectiveness are evaluated. Its feasibility is emphasized on students' satisfaction of using the program. Its effectiveness on enhancing comprehensive midwifery competency is performed in regard to the level of knowledge and clinical decision making skills among nursing students. The electronic learning program developed under a comprehensive approach would be the effective learning strategy for enhancing nursing students to be competent practitioners in nursing profession.

CHAPTER 3

METHODOLOGY

This study was conducted to develop an electronic learning program and evaluate its appropriateness, feasibility, and effectiveness. The procedures in this study were organized into two phases. The first phase was to develop an electronic learning (e-learning) program for enhancing comprehensive midwifery competency among nursing students. The second phase was to evaluate the program in terms of its feasibility and its effectiveness. In addition, the ethical consideration is addressed.

Phase I: Program Development

Purpose. The purpose of this phase was to develop an electronic learning program. Four steps were organized, i.e., identify learning needs of comprehensive midwifery competency, design learning modules, verify content and program appropriateness, and conduct a pilot testing of the preliminary e-learning. The details of these steps will be described as follows:

Step 1: Identify learning needs and specify domain of comprehensive midwifery competency (CMC).

Purpose. The purpose of this step was to identify learning needs and specify the domain of comprehensive midwifery competency. The needs refer to nurses' knowledge and clinical decision making skills for providing care to women, including their newborns and families during their intra-partum period and the care for their high risks during ante-partum, intra-partum and postpartum periods.

Participants. Purposive sampling was used to select participants in this step. Seven senior nursing students (fourth year students), seven newly registered nurse-RNs (graduated within 1 year), five senior nurses (≥ 5 years experienced in an obstetric ward), and five nursing educators in midwifery were invited to share their views on learning needs of comprehensive midwifery competency (total n = 24).

Instruments. The Learning Needs of Comprehensive Midwifery Competency: Interviewing Form was developed. It was used to explore the participants' perspectives related to learning needs for developing competency in midwifery practice.

The scope of content in the midwifery blueprint of Thailand Nursing Council was used to guide development of the interview form.

Procedures. The procedures were conducted in two steps: 1) focus groups and 2) summary of core content.

1. Focus groups. Four focus groups were conducted emphasizing participants' perspectives on their learning needs of comprehensive midwifery competency that should be used for developing midwifery competency. The procedures of each focus group were performed as follows.

1.1 Senior nursing students. The participants in this group had recent experience of learning from a midwifery course in their nursing curriculum. Their learning needs of comprehensive midwifery were expressed based on their experiences that might be useful for developing the current program. To conduct the focus group, letters were sent to the Dean of educational nursing institution to ask for permission. A one-hour focus group was carried out after approval from the Dean, at one educational nursing institution.

1.2 New RNs. The participants had recent experience on comprehensive midwifery competency examination at the educational nursing institution level and national level. Their experiences on these examinations were useful to them in their suggestions on learning core-content for developing the newly supplementary course. Individual invitation was performed and the focus group was carried out after their agreement to participate in the study, at one educational nursing institution.

1.3 Seniors nurses. The participants had experience in the situation of clinical practice. Their experiences were useful in guiding learning content of comprehensive midwifery competency into the newly developed program. Letters were sent to participants' administers to ask for permission. The focus group was carried out after the approval, at a hospital.

1.4 Nursing educators. The participants were instructors who were teaching in midwifery. Their experiences in developing learning midwifery course were appropriate in guiding core content of comprehensive midwifery competency. Letters were sent to their administrators and the focus group was performed after the approval, at an educational nursing institution.

2. Summary of core content. After completing the focus group meetings, learning needs of comprehensive midwifery competency were analyzed and CMC domains were constructed for developing learning core content of the comprehensive midwifery competency.

Data analysis. Content analysis of learning needs of comprehensive midwifery competency was performed. CMC domains and core content of comprehensive midwifery competency were structured for designing the learning modules of the program.

Step 2: Design learning modules.

Purpose. The purpose of this step was to organize the content and structure of electronic learning program.

Participants. A design committee team composing of the researcher, a nursing educator and a programmer.

Instrument. Moodle, a software program for learning management system was used to design the structure of the electronic learning program that was ready for verification of the program content and appropriateness.

Procedures. The process of designing learning modules composed of structuring learning modules and designing e-learning program. The CMC domains and core content were used to generate learning modules. Each learning module was designed and organized into the electronic learning program. The learning modules were designed for enhancing active learning by providing rich resources of learning and materials for flexibility regarding several styles of learning. The researcher as an instructor of the course was designed to take the role as facilitator, i.e., facilitating social interaction among learners by using webboard and e-mail.

Step 3: Verify content and program appropriateness.

Purposes. This step aimed to determine the validity of learning content, the quizzes and case studies of learning modules by using expert consensus. Additionally, appropriateness of the program was verified to determine its functional system.

Participants. Five experts who were teaching midwifery in an undergraduate nursing program were invited to validate content of the learning modules in terms of learning content, quizzes and case studies. Whereas, three experts who were

knowledgeable in electronic learning programs were asked to verify the appropriateness of the program.

Instruments. Two instruments - the developed learning modules from step 2 and Appropriateness of Electronic Learning Program Evaluation Form (AELP) were used. The AELP was developed to verify the program appropriateness. The AELP was conducted from themes and functions of e-learning studies, i.e., support active learning, facilitate the ease of use, and encourage interactive communication (Tsai & Chai, 2005; Sun et al., 2008; Wang, Wang, & Shee, 2007). The items were validated by three experts, their suggestions were used to revise the form. The AELP was a 4-points Likert's scale which consisted of 13 questions. The scale ranged from "need modification" to "high appropriateness", with scoring of 1 to 4 points for all questions. The scores of AELP rated by the experts were accepted at 3 and 4 points. In addition, the items of acceptable scores that were agreed upon by at least two experts were counted as appropriate items for use. A high score indicated high appropriateness whereas a low score indicated low appropriateness of the program.

Procedures. The initial electronic learning program that integrated the developed learning modules was sent to five midwifery experts to validate content. Moreover, it was sent to three experts who were knowledgeable in electronic learning programs to verify the appropriateness of its functional system. Finally, all experts' recommendations and suggestions were used to revise the electronic learning program.

Data analysis. All developed learning modules that were rated as acceptable by at least three of five experts were calculated by using content validity index (CVI).

The CVI values at > .80 of each module were accepted. The appropriate items were calculated by using percentages.

Step 4: Pilot testing.

Purpose. Pilot testing served as a trial to identify potential problems in using the e-learning program. Students' satisfaction on the designed procedures, learning period, program format and content and the quizzes were used to assess the feasibility of preliminary electronic learning program.

Participants. Five senior nursing students at a school of nursing were invited to participate in the pilot testing.

Instrument. The preliminary electronic learning program that composed of learning modules was used.

Procedures. The senior students were asked if format, content, quizzes, and case studies were ambiguous or confusing, and to provide suggestions for improvement. The participants were requested to express their satisfaction of using the program. In addition, they were asked to indicate a length of time that suitable to complete their learning throughout the program.

Data analysis. Participants' opinions were summarized. Their identified problems related to the program format, content, quizzes and case studies were modified for improvement. Their suggestions on design procedures and usage time period were used to guide procedures of the program implementation in the next phase. Then, the final version of electronic learning program was developed to be ready for further evaluation.

Phase II: Program Evaluation

Purposes. Program evaluation aimed to determine the electronic learning program's feasibility and effectiveness during its implementation process. This phase was undertaken based on the following details.

Participants. The sample size in this study was calculated by using power analysis from the study of Sung and colleagues (2008). The study was using e-learning on enhancing medication knowledge for new nurses and the result reported significantly higher levels of knowledge of medication in the e-learning group as compared to the control group. The sample size of 50 in two groups was able to detect a higher knowledge level by using t-test. The effect size (d) of the study was large (d =1.75). As a result, the effect size of the phenomena in this study was not as large as in the previous study. This was because the newly developed program was a six-learning module while Sung and colleagues' study was a single learning module. In addition, the population of the current study was different from that of the previous study. Therefore, the researcher selected a large effect size of 0.6 (α = .05, p = .80). Based on Cohen's principle (1998, p 55), 45 subjects per group were needed to be recruited, giving the estimated total sample size of 90 students. However, there were 108 students who applied to be volunteers in the study. Considering the possibly drop-out of participants, all volunteers were recruited.

The participants were nursing students who were voluntarily recruited from three educational nursing institutions in southern Thailand. Random assignment was used to divide the participants into two groups: e-learning and control. The e-learning group (n = 54) was invited to use the electronic learning program as a supplementary course. The control group (n = 54) was allowed to maintain their learning in the

regular course. Thirty-one (28.70%) participants (intervention = 18, control = 13) had dropped out of the program before completion. The drop out may have been caused by the current program being only a supplementary course. Without mandatory measures, some students in the e-learning group were unable to complete the post-test. In addition, the learning period was closed to the nursing licensing examination, therefore, some students were concentrating on the test preparation that required reviewing all subject contents. Finally, there were 36 participants in the e-learning group and 41 participants in the control group who completed the program. Considering the mortality effect that induces the differences between the persistent and initial recruited participants, the mean comparison of personal data between the drop-out and persistent group was examined. The result showed no significantly statistical difference between the two groups with regard to their age, GPA, anxiety level on the upcoming licensure examination and CMC pre-test scores ($t = 1.15, 1.54, -.54$, and 1.30, respectively, $p > 0.5$) (see Appendix E). Thus, data selected from 77 participants was used in analysis to evaluate feasibility and effectiveness of the program.

Instruments. Two instruments were used to determine feasibility and effectiveness of the electronic learning program as the following details.

1. Feasibility indicated an appropriateness of the electronic learning program for enhancing comprehensive midwifery competency. The feasibility was focused on student satisfaction in using the program. Limitations of utilization among nursing students were explored by using the satisfaction questionnaire.

The Satisfaction Questionnaire was used to assess satisfaction among the nursing students during use of the program. The Satisfaction Questionnaire was

developed by a researcher. It consisted of a 4-points Likert scale which had 34 questions (positive = 33, negative = 1). Its scale ranged from strongly disagree to strongly agree, with scoring from 1 to 4. The score of negative item was reversed. The total score were ranged from 34 – 136. Its content validity was evaluated by three experts in electronic learning (one medical educator, one nursing educator, and one computer science educator). Modifications were made based on expert suggestions. High score of satisfaction indicated high feasibility, whereas low score indicated low feasibility of the electronic learning program. Its content validity index was 1.0. The Cronbach's alpha coefficient of the satisfaction questionnaire used in 36 subjects of this study was .93.

2. Effectiveness indicated learning outcome throughout the electronic learning program. The effectiveness emphasized student achievement on the comprehensive midwifery competency; regarding knowledge and clinical decision-making skill. The comprehensive midwifery competency was investigated by the test questionnaires.

The Comprehensive Midwifery Competency (CMC) was a test conducted to determine level of core midwifery knowledge and clinical decision-making skills. This questionnaire was developed by a researcher. Its content validity was evaluated by five experts, midwifery educators working at Prince of Songkla University. The CMC composed 4-multiple choice of 130 items. Nursing students having high scores indicated high comprehensive midwifery competency. Passing 70% (> 91 scores) of the total CMC score was a criterion that used for indicating individual achievement in using the program. The CMC scores were also used to determine the achievement of the participants in the e-learning group comparing to the scores of the participants in the control group. The Spearman-Brown reliability of its total items in a small group

(n = 5) was .87. The Spearman-Brown reliability in this study (n = 77) was .70 and .76 of pre-test and post-test, respectively.

Procedures. The program was a two-week e-learning course. The researcher as an instructor took the role of facilitator in the learning environment. The procedures were employed step by step as follows:

1. An implementation process was established for utilizing the final version of electronic learning program after approval was obtained from the three educational nursing institutions in southern Thailand, two university schools and one nursing college of the Ministry of Public Health.

2. Senior nursing students were contacted in their classroom. The purposes of the study were explained. Agreement to participate in the implementation process of the study was obtained. The voluntary participants scheduled an appointment for getting involved in the program.

3. All participants were separated into e-learning or control group by using random assignment. The control group was informed to use the program later after a completion of the e-learning group. A pre-test procedure was used to assess the comprehensive midwifery competency by using the CMC questionnaires in all participants. The pre-test was measured two hours before the utilization of the electronic learning program.

4. The orientation session for use of the electronic learning program was organized at each educational nursing institution for two hours. Individual students in the e-learning group were described during a login process in order to access the course and trained to learn through e-learning program, prior to fully participating in the learning process.

5. During learning through the e-learning program, the participants were facilitated on their activities throughout the course with no time limitation. They could learn from any place that they have an internet connection. They were also allowed to contact their peers and the instructor via discussion board provided in the program and through personal e-mail.

6. Post-test of CMC was conducted in the third week, after completion the electronic learning program. All participants in both groups were asked to complete the CMC test one more time after completing the process of learning through the program.

7. Feasibility of overall program evaluated the satisfaction of the nursing participants in the e-learning group, following completion of the CMC post-test.

Data analysis.

1. The personal data of nursing students was analyzed by using frequency, percentage, minimal and maximal score, mean, and standard deviation. In addition, personal data of participants were compared to examine homogeneity between the e-learning and control group by using t-test.

2. Individual mean score of pre-test and post-test was compared to the CMC criterion scores (> 70%, 91 to 130 scores of the total score) separately. The number of participants that achieved and did not achieve the CMC pretest-posttest criterion was calculated by using a percentage. With regarding to a significance of differences in proportions for a pretest-posttest design, Chi-Square McNemar of binomial test is appropriate to use (Polit & Hungler, 2001; Monro, 2001). Therefore, McNemar of binomial test was used to analyze the differences between two-time testing.

3. The total CMC mean scores of each participant were used to compare between pre-test and post-test using paired t-test. This method of analysis was used for both the e-learning and control group.

4. The total CMC mean scores of pre-test and post-test for all participants were used to compare between the e-learning group and the control group by using an independent t-test.

5. The total mean scores of the satisfaction questionnaire for the e-learning group was used to determine nursing students' satisfactions of the overall program by using frequency, mean scores, and standard deviation. Frequencies of students, classified by level of satisfaction of each item, each dimension and overall scales were calculated respectively by average of mean.

In addition prior to evaluating the effectiveness of the program, assumptions of each testing were analyzed. Kolmogorov-Smirnov test was used to assess the normal distribution of the CMC scores. Levene's test was used to approve homogeneity of variance of the CMC scores (Monro, 2001).

Ethical Consideration

The study was started after getting approval from the Research Ethical Committees of Faculty of Nursing, Prince of Songkla University, and the Institutional Research Board of the regional hospital. The participants cooperating in the development phase and in the evaluation phase were given an overview of the study including the objectives, procedures of the study and their rights as participants. They were provided the opportunity to ask questions, and given the opportunity to withdraw their participation at any time. The participants were reassured that the data

collected in the study were used only for the benefit of the research report. Participants' names were protected for confidentiality. Code numbers were assigned to all participants and only code numbers were used for analysis. The report was presented as the whole picture. The tape records from focus groups were erased after the study was completed. After the explanation of the study, the participants were invited and asked to participate in the study. Participants in the control group were compensated for freely using the program after the completion of the program evaluation period.

All procedures in the development of the electronic learning program for enhancing comprehensive midwifery competency was summarized in Figure 4 (next page).

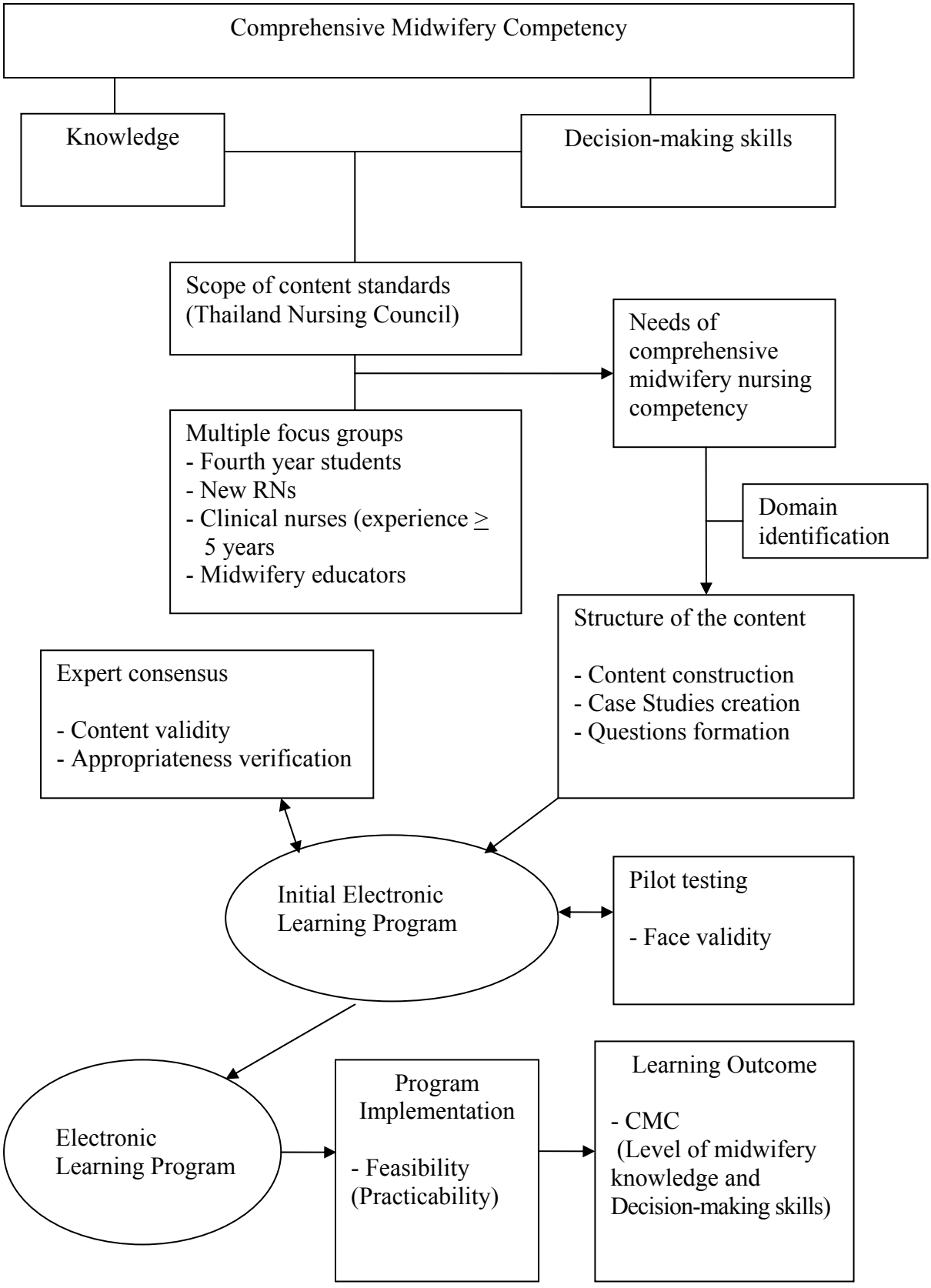

Figure 4. The procedures for developing an electronic learning program

CHAPTER 4

RESULTS AND DISCUSSIONS

The results and discussions will be presented regarding the research objectives and hypotheses. Since the procedures of the study were organized into two phases, the results and discussions will be presented based on the two phases, i.e., phase 1, program development and phase 2, program evaluation. The program development consisted of four steps: 1) learning needs identification and comprehensive midwifery competency (CMC) domain specification, 2) learning module design, 3) content and program appropriateness verification, and 4) pilot testing of preliminary electronic learning program. The program evaluation consisted of: 1) feasibility evaluation and 2) effectiveness evaluation. The results and discussions of this study are presented as follows:

Program Development

The purpose of the program development was to develop an electronic learning program. Four steps were organized, which were learning needs identification and CMC domain specification, learning module design, content and program appropriateness verification, and pilot testing of the preliminary electronic learning program. The details of the results are described below.

Learning needs identification and CMC domain specification

Learning needs assessment for developing comprehensive midwifery competency (CMC) from the focus groups was summarized as two components: 1) needs of core content and domains of CMC and 2) needs of e-learning format and functions.

1. Needs of core content were summarized from four focus groups, namely, nursing students (n = 7), new RNs (n = 7), senior nurses (n = 5), and nursing educators (n = 5). The core contents of midwifery from the interview were addressed (see table 2).

Table 2

Core Contents of Midwifery From the Participants' Perspectives (N = 24)

Topics	Subtopics
1. Principle of labor	Stages of labor, factors related to labor and delivery, and labor mechanism
2. Nursing care during the first stage of labor	Admission to the labor unit, labor assessment, and enhancing of labor progression
3. Nursing care during the second, third, and fourth stages of labor	Normal labor, placenta delivery, episiotomy and repair of vagina, and early postpartum care
4. Nursing care for newborn	Newborn assessment, early newborn care, apgar score, and prevention of hypothermia
5. Assessment of fetal well-being	Assessment and interpretation graphs that recorded fetal monitoring, and nursing care for women who needed the fetal assessment

Table 2 (continued)

Topics	Subtopics
6. Drug management during labor and delivery	Drugs for pain relief, for inhibition of labor and for induction of labor
7. Nursing care for high risk pregnant women	Assessment of high risk during pregnancy, teenage pregnancy, and elderly pregnancy
8. Nursing care for pregnant women with complications	Pregnancy induced hypertension, twins, and abnormality of amniotic fluid
9. Nursing care for pregnant women with medical and surgical disease	Diabetes mellitus, heart disease, urinary tract infection, hypo/hyperthyroid, and asthma
10. Nursing care for hemorrhaging pregnant women	Antepartal hemorrhage; abortion, ectopic, and molar pregnancy, abruption-placenta, and placenta previa
11. Nursing care for pregnant women with infectious disease	Hepatitis, rubella, Aquired Immuno Deficiency Syndrome, and syphilis
12. Nursing care for pregnant women with abnormal factors affecting labor	Power, passage, passenger, psychological response, and position
13. Nursing care for pregnant women with complications during labor and delivery	Premature rupture of membrane, preterm/ post-term labor, prolonged labor, uterine rupture, prolapsed cord and fetal distress, postpartum hemorrhage
14. Nursing care for pregnant women receiving assistance in labor	Induction of labor and operative procedures, e.g. forceps - or vacuum - assisted birth
15. Nursing care for postpartum women with complications	Hematoma, infection, phlebitis, post-partum depression
16. Nursing care for newborn with complications	Birth asphyxia, cardio pulmonary resuscitation, and birth injuries

In addition, the domains of CMC that were ready to be used in designing learning modules were structured into six: 1) basic knowledge of labor, 2) assessment of fetal well being, 3) drug administration during labor and delivery, 4) nursing care for pregnant women during the four stages of labor, 5) nursing care for newborns, and 6) nursing care for pregnant women at high-risk and with complications.

2. Needs of e-learning format and functions of the focus groups were summarized as follows (see Table 3).

Table 3

E-learning Format and Functions Needed From Participants' Perspectives

Needs
Providing animation with sound in some topics, especially, the mechanism of labor.
Content should be delivered in summary and easy to read
Mind map would be useful to guide contents and be easily understood.
Pre-test, post-test and feedback should be provided for more understanding
Case studies should be provided
Support for printable learning resources

Learning module design

The purpose of this step aimed at organizing the electronic learning program. The learning needs assessment of comprehensive midwifery competency from the interviews was summarized and designed into e-learning modules. The structure of e-learning modules in this program was composed of six units based upon the

domains of CMC. Additionally, an introduction unit was added at the beginning of all learning modules (see overview of the e-learning modules in Appendix D)

Details of the e-learning modules. The details of e-learning modules are presented as follows.

1. In the introduction, objectives of the program, outline of contents, and structure of the learning process were described.

2. Within each of the six units, *contents* were delivered in two format files, i.e., pdf and power point presentations. Learning activities were available in multiple ways.

3. The *quizzes* were provided as a pre-test and post-test of each unit. The test scores were presented on the screen when each learner completed each quiz and feedback was also provided.

4. Links to learning *resources* were also provided in order to encourage students to seek more information.

5. Learning *assignments* were designed to enhance more comprehension and facilitate the creation of students' competency. The learners were assigned to search for midwifery terminologies regarding the learning content of units. The learners were asked to place the terminologies into the course platform. Case studies were assigned for students to learn in groups. Forum or webboard in Moodle platform was provided in order to support their discussion.

6. The students were facilitated so as to have *interaction* with learning materials, their colleagues, and the instructor. Several tools were provided for their communication such as via forum, chat and e-mail. All of these activities were created

to facilitate knowledge sharing among learners. The learning environment was also designed to enhance nursing students to be active learners.

Content and program appropriateness verification

The purposes of this step were to verify the validity of learning content, quizzes, and case studies. Expert consensus was used to evaluate content validity of all learning modules for enhancing comprehensive midwifery competency. In addition, functional system of the initial electronic learning program was verified for its appropriateness.

Content validity. Content validity index (CVI) of learning modules was assessed into three parts: learning contents, exercises or quizzes, and case studies of five learning modules. The content validity indexes of all parts were 0.8 – 1.0.

In addition, eight scenarios were validated and accepted by expert agreements with some suggestions for modification. The suggestions of the experts were used to modify the learning modules. For example, changing the terms of question items, adding more questions about apgar score, and more details in the case studies. It was suggested that one case study be separated into two cases (two situations). Ultimately, nine case studies were integrated into the final e-learning program.

Program appropriateness. Eighty percent of expert validation ranging from 3 to 4 points was used as a criterion to accept the e-learning functional system. The result showed that all reports were acceptable as appropriate for use. The experts' suggestions were used for program improvement. For example, more interactive media resources were provided, as was and specific feedback for students who showed low scores in the test.

Pilot testing

This step was conducted to identify potential problems in program utilization. All five students reported a high satisfaction of the program format, content and quizzes. A guideline of the learning process in the introductory unit was reported as useful. That guideline told them what the overall learning modules were and how to learn throughout the entire program. They agreed that the program was easy to login on to. However, they mentioned that students needed to make sure that the login account was typed correctly when logging in to the course. The content presented in pdf format was not attractive. As a result, it was modified by highlighting with color the main idea before using it in the evaluation phase. The participants also suggested that a two week period was appropriate to complete their study of the complete program. Their suggestions were considered and used in the implementation step. In conclusion, the overall program was satisfactory to the participants in the pilot testing process.

Program Evaluation

Program evaluation was undertaken after the final version of the electronic learning program was organized. The results of program evaluation are presented for feasibility and effectiveness.

Personal data of the study sample

The participants in the study consisted of 77 senior nursing students who studied in three nursing schools in the southern part of Thailand. There were 36 participants in the intervention group and 41 participants in the control group completing the program (see Table 4).

Table 4

Frequency and Percentage Classified by Personal Data of Students in the E-Learning Group and Control Group (N = 77)

Personal data	E-learning group (n = 36)		Control group (n = 41)	
	Frequency	%	Frequency	%
Age				
21	1	2.80	2	4.90
22	22	61.00	23	56.10
23	11	30.60	13	31.70
24	1	2.80	3	7.30
26	1	2.80		
Gender				
Male	1	2.80	1	2.40
Female	35	97.20	40	97.60
GPA				
< 2.50	1	2.80		
2.50 - 2.99	12	33.33	18	43.90
3.00 - 3.49	21	58.33	20	48.78
$\geq$ 3.50	2	5.54	3	7.32
Anxiety level regarding the licensure examination				
No anxiety	1	2.80		
Mild anxiety	8	22.20	10	24.40
Moderate anxiety	16	44.40	14	34.10
High anxiety	11	30.60	17	41.50

Table 4 revealed that the majority (n = 69, 89.61%) were 22-23 years old. Mostly, participants had a grade point average (GPA) of between 2.50 to 3.49 (n = 71, 92.21%). Approximately, seventy five percent of them (n = 58, 75.35%) reported a moderate to high level of anxiety about their licensure examination.

In addition, the comparison of students' personal data between the e-learning group and control group were compared as in Table 5.

Table 5

Comparison of the Personal Data of Students in the E-Learning Group and Control Group (N = 77)

Personal data	E-learning group (n = 36)		Control group (n = 41)		t-value
	Mean	SD	Mean	SD	
Years of Age	22.44	.84	22.42	.71	.17 [ns]
GPA	3.11	.25	3.04	.30	1.05 [ns]
Anxiety scores on upcoming licensure examination	3.03	.81	3.17	.80	.78 [ns]
Pre-test CMC scores	86.92	9.75	84.15	8.73	1.32 [ns]

[ns] = non significance

The results showed no statistically significant differences of the personal data of the students; regarding years of age, GPA, anxiety scores on the upcoming licensure examination, and pre-test CMC scores between the two groups. The results indicated homogeneity of the personal characteristics among two groups of subjects.

Additionally, considering to the homogeneity of participants among three educational nursing institutions (university1 = 21, university 2 = 22, college = 34 subjects) the comparisons between those of students' personal data of each educational institution were compared. The results showed no statistically significant differences of those students' personal data ($t = .09$ to $.98$, $p > .05$).

Feasibility evaluation

Feasibility was used to indicate an appropriateness of the electronic learning program for enhancing comprehensive midwifery competency. The feasibility focused on students' satisfaction on using the program (see Table 6).

Table 6

Possible Score, Actual Score, Mean and Standard Deviation Classified by Overall and Dimensional Scores of Students' Satisfaction (N = 36)

Satisfaction	Possible score	Actual score	Mean	SD
	Min - Max	Min - Max		
Overall	1 - 4	3.03 - 3.72	3.78	.21
Program format	1 - 4	3.03 - 3.69	3.41	.22
Content	1 - 4	3.28 - 3.61	3.48	.12
Quizzes	1 - 4	3.42 - 3.72	3.58	.11
Activities	1 - 4	3.03 - 3.50	3.22	.17
Significance	1 - 4	2.97 - 3.44	3.26	.25

According to the results, most participants who learned throughout the e-learning program reported a high level of satisfaction to the overall program (Mean = 3.78, SD = .21). The majority reported a high level of satisfaction regarding program format, content, quizzes, activities, and significance that was indicated by the mean scores of all dimensions being more than 3 points. Considering the dimensions of satisfaction, participants rated the highest level of satisfaction on "program quizzes" (Mean = 3.58, SD = .11). Whereas, the "program activities" was rated as the lowest level of satisfaction (Mean = 3.22, SD = .17). It can be concluded that most participants reported a high level of satisfaction for the e-learning program.

Considering overall items using mean scores, most participants rated high satisfaction (Mean = 2.97 - 3.72, SD = .05 - .65) (see also table 11, appendix D). It was reported that “quizzes facilitate students to review knowledge by themselves” had the highest score of satisfaction (Mean = 3.72, SD = .45). The next highest mean score was “program encourages self directed learning” (Mean = 3.69, SD = .47). In view of the lowest mean score, it was indicated that “the length of time is appropriate for learning” had the lowest score of satisfaction (Mean = 2.97, SD = .65). The next lowest scores were “program supports interaction among students and with the instructor” and “discussion facilitates knowledge sharing” (Mean = 3.03, SD = .65 of both items).

In addition, the students’ perspectives through e-learning experiences were reported by the open-ended questions in terms of advantages, obstacles and suggestions. These points of view are summarized as follows.

Advantages:

Four aspects of the advantages of learning through the e-learning program were reported. They were advantages of the overall program, content, activity, and significance.

1. The advantages of the overall program were: 1) facilitating students’ learning throughout the new teaching-learning approach, 2) convenient and easy to use, 3) enhancing active learning, 4) enhancing self directed learning, 5) promoting students’ responsibilities in learning, 6) promoting students’ autonomy in learning, and 7) facilitating knowledge sharing online (without physical appearance).

2. The advantages of the program content were: 1) providing a new presentation method which was interesting, 2) presenting attractive instruction tools

e.g. multimedia and power points, 3) appropriate sequential organization, 4) delivery using precise and relevant contents, 5) easy to visualize midwifery situations, 6) linking to useful resources to enable students to comprehend more in midwifery.

3. The advantages of program activities were: 1) providing useful online quizzes, rapid feedback and answers, 2) revealing quiz scores was helpful for self assessment, 3) facilitating communication via a webboard enabled freestyle (informal) friendly interaction, and 4) providing interesting overall activities.

4. The advantages of program significance were: 1) worthwhile learning, time saving and economical - no need for printed materials; it could be saved and copied, 2) useful learning dependent on self readiness to learn, and 3) learning with no limitations of time and place.

Obstacles:

The obstacles were summarized into 3 parts:

1. Time period of learning course: two weeks was reported as insufficient time to engage in all contents.

2. Speed of internet: low internet speed was time consuming when linked to resources and power point presentations.

3. Learning activities: group assignments for case studies was considered a work overload by some, and inconvenient for online-discussions with colleagues, since some of them did not respond.

Suggestions:

The students' suggestions are summarized as follows.

1. Learning period: the program should be provided approximately one month prior to the licensing examination.

2. Future implementation: the program should be provided for fourth year nursing students prior to practice in clinical situations. Students should be prepared to get ready prior to taking the comprehensive and licensing examinations. A course on maternal-newborn nursing should be created and provided for students together with this course.

3. Assignment: case studies should be assigned to individuals. However, if it was assigned to a group, students from the same school should be placed in the same group.

4. Quizzes: online quizzes should be multiple choice format only. Its format should not be true/false. Additionally, more online quizzes should be provided.

With regards to the findings, high satisfaction indicated that the learners had good experiences through the e-learning course. This can also be supported by the open-ended feedback in which the learners reported the course as flexible. It was accessible with no limitation of time and place. They also perceived that the e-learning program was convenient and easy to use. The participants rated program quizzes, content and format as the three highest levels of satisfaction, respectively. Findings were supported by Pullen (2006) that the majority of learners (87%) reported a high satisfaction to the online course structure, and course content (95%). Pullen also indicated that learners found it convenient to be able to learn at home. In the same way, Reime and colleagues (2008) conducted e-learning on infection control. They found that 70% of nursing students were satisfied with e-learning and perceived a good quality of design and content. The learning test was a feature that motivated their learning. The results were consistent with another study by Chang and colleagues (2008) who reported a high rating regarding satisfaction of staff nurses on

the e-learning course. Therefore, the variety of types of learning content, program format and quizzes were considered as effective components in e-learning that would increase the degree of learner satisfaction.

Students reported that the e-learning was a flexible way of learning. This view was supported by two studies (Kenny, 2002; Wilkinson et al., 2004). The students indicated that learning online allowed them access at anytime. Findings were somewhat in line with Sun and colleagues' (2008) findings, who indicated that e-learning course flexibility, e-learning course quality, perceived usefulness, and perceived ease of use were the critical factors affecting learners' perceived satisfaction.

The e-learning program in this study reported its encouragement for students to be active and self directed learners. The learners also stated that the e-learning program their greater learning responsibility. Learning through the program supported their learning autonomy so that they could learn, engage and repeat any parts of the modules. Similarly, Kenny (2002) reported the students' experiences of learning online. Students indicated that learning was independent and self directed in that they could study the lectures in their own time. It also encouraged students to increase their responsibility to meet learning goals. In this point, the result was consistent with constructivist view in encouraging learners to build their own knowledge based on individual experience (Paurelle, 2003).

In addition, the participants perceived that the e-learning course was interesting. The students also indicated that interactive media such as video and power point presentations, links to a variety of resources and the online quizzes, allowed students to be more attracted to the course and also increased their comprehension.

Students had an interested in the program may due to the visual and auditory interfaces that designed for the learning materials were realistic midwifery situation (Gerjets & Hesse, 2004). The study results were also supported by constructivist view that providing the rich resources of learning materials regarding several styles of learning can enhance students to be active and self directed learners in learning environment (Kelsey, 2007; Low, 2007). Likewise, some researchers (Kenny, 2002; Gibbon & Currie, 2008) claimed that e-leaning enabled students to learn through a variety of resources and learning styles that had an effect to motivate and satisfy them. In this regard, it can be explained that particular resources such as the hyperlinks, the animations, and the online quizzes were the teaching-learning approaches that influenced students' motivation and satisfaction. Such resources also were the essential factors that made students maintain interest, as well as interactive and independent study.

Furthermore, the significance of e-learning was reported. The current finding was similar to Huckstadt's and Hayes' (2005) who claimed that e-learning was innovative, time saving, convenient and economical. Similarly, a study by Berk and Wiseman (cited by Chang et al., 2008) indicated that e-learning course could save approximately 25 - 60% learner time when compared to traditional classroom. The result is consistent with a study of a blended learning program on medication administration by Sung et al. (2008). The researchers claimed that e-learning program can reduce the lecturing time and cost of repeated topic in nursing education. In contrast, a report of a pilot test across three state nursing schools indicated that many students thought it to be two to three times more time-consuming to do online courses than traditional classes (Billings, Connors, & Skiba, 2001). Regarding the significance

of e-learning, most results indicated that an e-learning program was time saving and economical to use. As a result, e-learning is an alternative approach of teaching-learning.

However, the obstacles of engaging in an e-learning environment were indicated by some students in the open-ended feedback. Low speed of internet in some institutions made students face difficulty learning as they spent much time materials down-loading. Findings were similar to Lu, Lin, and Li (2009) who reported that the difficulties with hardware, software, and internet connectivity were the frequent sources of students' frustration. Computer connection was a crucial factor that enabled interaction at the same time (synchronous) and at different times (asynchronous) and online-cooperation, as well as to provide access to large amounts of learning resources (Gerjets & Hesse, 2004). It can be considered that low speed internet connection may be a barrier to learners' satisfaction and learning outcomes. Thus, strong computer technical support might enhance their satisfaction (Chang et al., 2008).

In view of the learning period, some participants indicated that they required a greater length of time, for example they proposed four weeks as an appropriate period to complete the e-learning course. The result is consistent with Reime and colleagues (2008) who reported that nursing students rated the e-learning course as a useful resource that helped them achieve learning goals. However they preferred more time to study. The result showed that students who used the most learning resources had significantly higher scores than those who used the least. The researchers claimed that individual study time was the greatest influencing factor to learning outcomes. To construct effective learning experience, educators needed to allow students to use

sufficient time to interact with the content and e-learning environment (Billings, et al., 2001). Their suggestion was that three hours per week for a three-credit course was appropriate for students to use in an e-learning course. Accordingly, providing an appropriate length of time that facilitates students overall learning should be considered in a further study.

A report of one study (Wilkinson et al., 2004) indicated a lack of human contact, and materials that were too prescriptive as the negative side of e-learning. None of the participants reported these of the negative aspects in the current study. It can be explained that most students had experience of enrollment in a basic computer course prior to study in the current e-learning program. In addition, the program modules were delivered in a variety of learning styles including pdf files, power point presentations, quizzes, case study, webboard and multimedia. Furthermore, all e-learning modules had been approved as having high functional appropriateness by specific experts in nursing and e-learning. These features might facilitate learners in the e-learning environment. As a result, they rated high satisfaction to overall program dimensions. Thus, the expert validation of e-learning modules assures educators of quality of learning materials.

Considering learning environment based on constructivism, it focuses on social interaction that enhances effective learning. The e-learning program based on constructivism provided an opportunity for discussion among learners so that could share idea, gain new knowledge and collaborate with no physical appearance (Paurelle, 2003). The result of Lu and colleagues (2009) revealed the positive reaction that nursing students were excited to learn and share their experience with peers in the e-learning environment. However, it was inconsistent with the report of this study.

Though some students perceived that webboard facilitated their communication and they enjoyed informal interaction with peers, they indicated the inconvenience of using online discussion for case studies since some members of their group were not engaging in it. It seemed that some of them disregarded their assignments. Similarly, a study of Sung et al. (2008) reported that nursing students feel a lack of connectedness with peers on the discussion board. This factor is also indicated as a negative correlation to satisfaction. Thus, the current findings might be affected to program activities that the participants rated with a lowest score of satisfaction in this dimension.

The lack of connectedness with peers on the discussion board can be explained by saying that the current e-learning program was provided as a supplementary course with no grading counted towards the actual curriculum. Most participants had experience of face to face class and group work. As a result, they might have been unfamiliar with an online discussion for group work. For that reason, some learners only engaged in reading case studies and disregarded discussions with others via the webboard. Another reason might have been that the learning period was close to the licensing examination, so they needed to be organized and ready in many subjects. Consequently, they had less time to concentrate on the new program. They thought that discussing the case studies was a workload presented with open-ended feedback. Some students might need to completely engage the other parts of the course that they interested in. As a result, some students spent less time on the discussion.

The results indicated by higher satisfaction on the part of participants in the dimensions of content and quizzes more than in the activity dimension. The findings were supported by Chang and colleagues (2008) who developed e-learning program

for improving knowledge and skills for staff nurses. They found that most learners did not need to leave the learning units to participate in discussions because they thought that they could save so as time to focus on learning content only.

Additionally, the difficulty of using online communication was supported by Twomey's study (2004) which reported that learners who were new to the online environment often face the difficulty of online communication. The researcher claimed that interaction to the online environment was because of a lack of non-verbal cues and the usual face to face culture of communication that they were familiar with. Similarly, Dorrian and Wache (2009) reported that some students felt difficulty with online discussions since they preferred making direct contact with others. Thus, training new learners to be familiar with online communication, especially completing collaborative work assignment in groups is an important consideration for nurse educators to produce an effective learning environment. Counting the credit of an e-learning course as part of actual nursing curriculum is also considered an important issue that can build students' responsibility in group work.

In conclusion, high rated satisfaction and the advantages of delivering e-learning responses to open-ended questions showed the feasibility of the current e-learning program. The findings were consistently supported by several studies. The current e-learning program is assured as an effective learning method that enables its feasibility in nursing education. With regards to constructivist view, encouraging students to involve in a meaningful social interaction is a crucial factor for effective learning environment.

Effectiveness evaluation

The effectiveness evaluation of the e-learning program was emphasizing on students' learning outcome. The learning outcome focused on comprehensive midwifery competency in term of knowledge and clinical decision-making skills. The comprehensive midwifery competency (CMC) was investigated by the CMC questionnaire.

To evaluate effectiveness of the e-learning program, testing of three hypotheses on the learning outcome of the program was conducted. The results of each test will be presented as follows.

Hypothesis 1. In the e-learning group, numbers of nursing students who reached the CMC criterion (getting at least 70% of total scores) in the post-test would be significantly increased when compared to those in their pre-test.

In order to compare the numbers of nursing students who reached the CMC criterion between pre-test and post-test, frequencies of participants who reached the CMC criterion were analyzed as shown in Table 7.

Table 7

Number of Students in E-Learning Group Classified by Status of Achievement at the Pre-Test and Post-Test (N = 36)

Status of achievement	Pre-test n (%)	Post-test n (%)
Achieved	12 (33.33)	22 (61.11)
Not achieved	24 (66.67)	14 (38.89)

The results showed the number of participants who achieved to the CMC criterion in the pre-test and post-test (n = 12, 33.33%) and (n = 22, 61.11%) respectively. The results indicated that after learning through the program, the number of participants who achieved the CMC criterion had increased when compared to that before using the program. In contrast, the number of participants who did not achieve the CMC criterion in their post-test had reduced when compared to that before using the program (n = 24, 66.67% to n = 14, 38.89%).

To test the significant differences in proportion of subjects in a pretest-posttest design, Chi-Square McNemar of binomial test was used. The significant difference in proportion of students in e-learning group who reached the CMC criterion at the pre-test and post-test was found as presenting in Table 8.

Table 8

Comparison of Student Numbers in E-Learning Group Who Achieved the CMC Criterion at the Pre-Test and Post-Test by Using Chi-Square McNemar Test (N = 36)

Pre-test	Post-test		χ^2
	Not achieved (n)	Achieved (n)	
Not achieved	14	10	
Achieved	0	12	9.13**

**p < .01

The results indicated that after completing the 2-week e-learning program, the proportion of students who achieved the CMC criterion had significantly different at

their pre-test and post-test ($\chi^2 = 9.13$, $p < .01$). Considering the direction of changes, approximately ten participants who did not achieve in the pre-test could reach the CMC criterion in their post-test. While all participants who reached the CMC criterion in the pre-test had gain re-achievement in their post-test. The results indicated that the number of participants who could reach the CMC criterion had statistically increased in post-test when compared to their pre-test.

In response to the first hypothesis, the findings reported that nursing students who had learned through the e-learning program had higher achieved to the CMC criterion of their post-test when compared to their pre-test. The results indicated that the e-learning program could improve nursing students to reach the CMC criterion.

Hypothesis 2. Nursing students who had learned through the e-learning program would report a significantly higher mean score of comprehensive midwifery competency in the post-test than their mean score in the pre-test.

Prior to comparing the differences of pre-test and post-test scores of the e-learning group and control group, normal distributions of those scores of each group were tested by using Kolmogorov-Smirnov test (see Appendix E). The values of Kolmogorov-Smirnov test for the pre-test and post-test CMC scores of e-learning group were non statistically significant (0.56 and 0.49, respectively). In addition, non significant values were found in the pre-test and post-test CMC scores of the control group (0.47 and 0.48, respectively). The results indicated normal distribution of those CMC scores that met the basic assumption of using pair t-test.

To test the hypothesis, paired t-test was used to compare mean differences between the pre-test and post-test of each student's CMC scores in both groups. The

significant difference between the pre-test and post-test CMC scores of students was found only in the e-learning group as presented in Table 9.

Table 9

Comparison of Mean Differences Between the Pre-Test and Post-Test CMC Scores in E-Learning and Control Group Using Paired T-Test (N = 77)

Groups	Mean	SD	Paired t-test
E-learning group (n = 36)			
pre-test	86.92	9.75	- 9.38***
post-test	93.25	9.19	
Control group (n = 41)			
pre-test	84.15	8.73	- .69 ns
post-test	84.76	9.36	

*** $p < .001$, ns = non significance

The results indicated that after learning through the e-learning program, participants in the e-learning group had significantly higher CMC scores than their scores in the pre-test ($t = -9.38$, $p < .001$). In contrast, students in the control group, had no significantly different CMC scores between their pre-test and post-test ($t = -.69$, $p > .05$).

The findings indicated that comprehensive midwifery competency of the e-learning group was increased after taking the e-learning program. While, those CMC scores of students in the control group between the two times testing were not different.

Hypothesis 3. Nursing students who had learned through the e-learning program would report a significantly higher post-test mean score of comprehensive midwifery competency than those of the control group.

In addition to using the Kolmogorov-Smirnov test, the Levene's test was applied to assess homogeneity of variance of the post-test CMC scores for both e-learning and control groups. The test result showed non statistically significant which indicated that both groups had on difference in variances of the CMC scores (see Appendix E). Finally, the results of the Kolmogorov-Smirnov test and the Levene's test confirmed for normal distribution and homogeneity in variance of all students' CMC scores and that met the basic assumption of using the independent t-test.

To test the hypothesis, independent t-test was used to compare the post-test CMC mean scores between the e-learning and control groups. The significant difference of the post -test CMC scores of students between the two groups was found as presented in Table 10.

Table 10

Comparison of the Post-Test CMC Mean Scores Between the E-Learning and Control Groups Using Independent T-Test (N = 77)

Groups	Post test		t-value
	Mean	SD	
E-learning group (n = 36)	93.25	9.19	4.01***
Control group (n = 41)	84.76	9.36	

***p < .001

The findings showed that comprehensive midwifery competency of the e-learning group was significantly higher than those in the control group ($t = 4.01$, $p < .001$). In responding to the finding, it indicated that students' comprehensive midwifery competency of the e-learning group were increased after learning through the e-learning program. It can be concluded that the e-learning program is an effective learning method for enhancing midwifery competency of the senior nursing students.

Discussion on the hypothesis testing regarding the program effectiveness

Considering to the learning environment in this study, it was structured under constructivist learning theory that values on multiple ways of understanding knowledge and constructing new knowledge (Hiemstra, 2007). The midwifery competency e-learning program was the web-based course, in which specific content of midwifery knowledge provided for supplementary course by using Moodle software as a platform. The advantages of e-learning is acknowledged that it is a flexible learning method that enabling students access regardless of time and location (Adam, 2003). The Moodle software provided a variety of content presentations together with extend resources, quizzes, case studies assignment, and a number of communications such as webboard, e-mail, chat and instant message.

The multiple ways of knowledge delivery and facilitating individual interaction with the e-learning environment enabled learners to be more actively involved in learning process (Kelsey, 2007; Low, 2007). Such approaches encourage learners to build their knowledge and achieve their learning outcomes that illustrated by the results of this study. The results provided support for the learning environment that encouraging learners to be more active on self-directed learning and helping them

to create their knowledge comprehension. The findings indicated that after using the e-learning program, students' competency regarding knowledge and decision-making skills can be improved. It is considered that an intensive systematic strategy using computer technology together with constructivist viewpoint enabled the program effectiveness in terms of the achievement of students' learning outcomes.

With regards to the findings of this study, students reported several advantages of the program. For example, the program provided multimedia and power point presentations that attracted students to maintain their learning throughout the program. The extended resources provided students for seeking more information so that enabled them to gain more knowledge. Students also reported that the program was well organized that delivered precise and relevant content. The program quizzes provided rapid feedback that enabled students to improve their learning. Communication through the program facilitated students to be friendly connected with their peers. In addition, learning through the e-learning program was time saving and flexible that they could learn anytime and any place. In conclusion, students perceived that the program was beneficial to their learning. Such perceptions encouraged students to be more active and self-directed learners so that enabled them to create more comprehension and achieved on desired learning outcomes.

The findings of the hypotheses testing were supported by the evaluation of interactive online courses for advanced practice nurses conducted by Huckstadt and Hayes (2005) and the study of web-based learning impact on continuing professional education by Pullen (2006). The previous studies were consistent with this study that all participants perceived the program benefits on its time saving and flexible. The learning materials and online discussion board facilitated students on learning

achievement. In conclusion, the newly developed program designed to promote learning environment allowed students to learn actively and independently by using several materials so that the learners could take more time and review learning materials at any time and any places.

The result of using e-learning program as a supplementary course that increase learners to be competent professionals in this study were supported by Sung et al. (2008). The study used a blend learning; the integration of e-learning program and face-to-face instruction in the classroom, for instruction medication administration among new nurses. The blended learning provided the same benefits, i.e., time saving and flexible ways of learning, as this study that it reduced the lecturing time and facilitated students to repeat topics. Integration of e-learning together with traditional classroom teaching is a flexible approach that enabled students to gain more knowledge than the use of traditional classroom in teaching-learning only.

The result of hypothesis testing is also consistent with the findings of Liao (2007) that performed a meta-analysis of fifty two studies by synthesizing existing research on the effects of computer assisted instruction of both stand alone and online courses versus traditional instruction on students' achievement in Taiwan. The strength process of his study confirmed the benefits of integration the computer technology into teaching-learning instruction over traditional classroom. Comparing the effect size (ES) of online course on students' achievement between the study of Liao (ES = 0.5) and this study (ES = 0.9), it indicated the need for further study to the effectiveness of the program and research design that can maximize the validity of the study.

In contrast, the results of this study were inconsistent to the study of web-based teaching for undergraduate nursing students in electrocardiography by Jang and colleagues (2005). The study found that the web-based group had significantly lower knowledge scores than those of students in the control group that using face-to-face lecture. The program provided the same approach, i.e., learning content, extensive resources, and immediately feedback to answer questions for senior nursing students, as this study. However, the previous program was failure to improve students' knowledge. The result may caused by inappropriate materials which were developed by a web designer instead of the course instructors. The program was designed only for facilitating students to access the course. In addition, the previous study did not provide online discussion among the learners and with instructor. Whereas, this study was developed by collaborative between the instructor and web designer, online discussion were also provided in order to facilitate student-student and students-instructor interactions. Therefore, instructor's involvement in designing learning content and learning activities would enhance students learning outcomes.

The study by Reime and colleagues (2008) also reported inconsistent results with this study. The previous study provided teaching course on infectious control for the second year nursing students, however some topics was not included in e-learning content. Therefore, structuring sufficient learning content is crucial for designing effective e-learning program.

In addition, two studies found no difference between e-learning and traditional courses on learning outcome (Chang et al., 2008; Lewis et al., 2005). The limitation of those programs in improving students' achievement was caused by the online discussion was not provided. The other possible reason was due to the earliest

learning packages used text-only. The materials may not be interesting and was failure to motivate students to maintain effective learning throughout the course. On the other hand, the midwifery e-learning program of this study was designed using precisely content delivery together with interactive media in order to facilitate students to reach their learning achievement.

Regarding to the effectiveness of e-learning program, the researcher agreed with Atack and Rankin (2002) who conducted the study of registered nurses' experiences towards web-based learning. Based on their findings these researches claimed that e-learning courses enabled students to gain knowledge as equivalent as or greater than students in traditional classroom. Likewise, e-learning could be use as a complement teaching-learning method. In addition, Ruiz, Mintzer and Leipzig, (2006) supported that the e-learning program should not be designed to replace traditional classroom teaching. As the result, the newly developed program was provided as a supplementary course in order to enable the students to gain more effective learning than using the traditional classroom only.

Summary

This chapter reported the results to answer four proposed research questions. The development and evaluation of electronic learning program for enhancing midwifery competency produced favorable results. The finding provided a set of core content and structure of e-learning program. The program appropriateness was approved. The feasibility evaluation of the program revealed a high level of participants' satisfaction. The evaluation of program effectiveness was demonstrated

that the newly developed program can enhance comprehensive midwifery competency among senior nursing students. The applications for nursing and recommendations for further study will be presented in the next chapter.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

In this chapter, the conclusion of the study will be made. Strengths and limitations of the study will be described. Finally, implications for future utilization in nursing and future study will be recommended.

Conclusion of the Study

The e-learning program was developed for enhancing comprehensive midwifery competency among undergraduate nursing students. The results of development and evaluation processes will be presented by each objective as follows.

Objective 1: To develop an electronic learning program for enhancing comprehensive midwifery competency among undergraduate nursing students.

The structure of the e-learning program was organized through literature review and four separately focus groups. The six domains of core content of comprehensive midwifery competency were obtained and structured into the e-learning modules. The content validity of each learning components was examined by five experts, yielding the content validity index from .8 to 1.00. Lastly, the pilot testing of the preliminary program was conducted by five nursing students.

Objective 2: To evaluate appropriateness of the electronic learning program.

Three experts verified the program and approved for its appropriateness. In addition, their suggestions on providing more interactive media resources and specific

feedback for students who showed low scores in the test were used to refine the program.

Objective 3: To evaluate feasibility of the electronic learning program.

The feasibility of the program was examined by having 36 seniors nursing students learned through the program. The findings showed a high level of students' satisfaction on the overall program (M = 3.78, SD = .21). Considering to each component of the program, quizzes was rated as the highest level of satisfaction (M = 3.58, SD, .11). While, the program activities was rated as the lowest (M = 3.22, SD = .17). Two barriers were found, i.e., low internet speed and inadequate peer participation on discussion of the case study.

Objective 4: To evaluate effectiveness of the electronic learning program on students' learning outcomes.

The effectiveness of the program was supported by the following evidences.

1. The number of students in the e-learning group who reached the CMC criterion ($\geq$ 70% of the total scores) on the post-test was significantly higher than those on the pre-test ($\chi^2 = 9.13$, $p < .01$).

2. The CMC mean scores in the e-learning group on the post-test was significantly higher than those on the pre-test ($t = -9.38$, $p < .001$).

3. The post-test CMC mean scores of the e-learning group was significantly higher than those of the control group. ($t = 4.01$, $p < .001$).

In conclusion, the findings of the program development processes are sufficient to provide evidences supporting for the appropriateness and feasibility of the newly developed program. Additionally, the examination of the program effectiveness indicated that the e-learning program could be an effective

supplementary course for enhancing comprehensive midwifery competency among the senior nursing students.

Strengths and Limitations

Strengths.

1. The use of constructivist learning theory as a guide in designing the e-learning environment reflects an effective approach in nursing education. The development of e-learning program based on constructivism was useful in yielding an effective learning environment that facilitated nursing students to become competent professionals.

2. The application of CIPP model provided a comprehensively systematic framework for program development and evaluation. The conceptual structure provided a rigorous evaluation strategy that helped in testing the quality of the program.

Limitations.

Two major threats to validity of the study results, especially in the evidences supporting for the effectiveness of the e-learning program were found as follows.

1. Threats to internal validity.

1.1 History. There was a variety of tutoring programs that had been organized for students in each educational institution at the same period of implementing the e-learning program. The event can affect to the effectiveness of the program.

1.2 Diffusion of treatment. The participants from each educational institution were included in both the e-learning group and the control group. The

participants of the two groups could communicate to each other. The situation can cause the results of comparing effectiveness between the e-learning group and the control group since the e-learning participants possibly shared their experiences and learning materials to the participant in control group.

1.3 Measurement. Although the CMC test was tested for its content validity and reliability in terms of internal consistency, more evidences supporting the quality of the test were needed, especially the discrimination and difficulty of each test item. Lack of confidence in the quality of the test may affect the validity of program evaluation.

2. Threats to external validity.

Interaction of selection and treatment. Because the recruited participants were volunteers, some might be a group of participants who could cope with stressful situation of upcoming licensure examination and eager to experience the newly developed program. Some might be interest in the program because of their competent in using computer and have intention to fulfill their midwifery knowledge. In addition, the program was using only in the group of senior nursing students. Because the e-learning program was implemented in three educational institutions, resources for conducting the e-learning program, especially, online facilities of each educational institution were different. This selection bias may be the limitation of the study results to generalize across the population.

Implication for Nursing

Implication for nursing education. The development of the e-learning program for enhancing midwifery competency among nursing students helps in promoting professional nursing fulfillment. The supplementary course can be used to facilitate nursing students for being the competent nurses who provide qualified midwifery practice to Thai people. In addition, it would help the nursing students to gain understanding in core knowledge and decision-making skills in midwifery and that would ensure their achievement on examination for nursing licensure.

Implication for healthcare personnel. The e-learning program may be beneficial for individual nurse or health care managers for professional training to increase competence in midwifery in order to maximize the quality of midwifery practice provided to the public.

Considerations for usage the e-learning program. The results showed that small students participated toward the learning environment. This notion may be an important factor that can be influencing on a successful of the program, especially impact to their achievement in learning outcomes.

To maximizing the effectiveness of the program, considerations for usage will be highly recommended as the followings.

1. An intensive orientation of using online discussion, especially in group working should be planed.

2. Strategy that encourages students to involve in the collaborative knowledge sharing should be designed.

3. Arrangement of sufficient online learning resources that allow instructors to provide an effective teaching-learning approach to their students should be considered.

Recommendation for Further Study

1. Prospective study for testing the effectiveness of the newly developed program on the participants' achievement of the licensure examination would be the first priority for future research.

2. The combination of the e-learning program with traditional classroom teaching in midwifery should be developed. In addition, integration of the program into the nursing curriculum would help in sustainable development for the nursing education.

3. The evaluation of learning outcomes on the quality of midwifery practice need for further study by controlling all threats to validity of the study as mentioned on pages 105 - 106.

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APPENDICES

APPENDIX A

PROTECTION OF HUMAN RIGHTS

Protection of Human Subjects' Right (Preliminary stage)

แบบพิทักษ์สิทธิ์ผู้เข้าร่วมวิจัย (ระยะพัฒนาโปรแกรม)

สวัสดีค่ะ

ดิฉันนางศศิกานต์ กาละ ผู้ช่วยศาสตราจารย์ คณะพยาบาลศาสตร์ ม.สงขลานครินทร์ กำลังดำเนินการวิจัยเรื่อง การพัฒนาสื่ออิเลคทรอนิกส์เพื่อสร้างเสริมสมรรถนะด้านความรอบรู้ทางการผดุงครรภ์ในนักศึกษาพยาบาล มีวัตถุประสงค์เพื่อสร้างสื่อที่มีประสิทธิภาพและสร้างเสริมสมรรถนะทางด้านการผดุงครรภ์ให้กับนักศึกษาพยาบาล

ซึ่งการวิจัยครั้งนี้เป็นส่วนหนึ่งของการศึกษาปรัชญาดุษฎีบัณฑิต และโครงการนี้ได้ผ่านการสอบโครงร่างวิทยานิพนธ์ คณะพยาบาลศาสตร์ มหาวิทยาลัยสงขลานครินทร์ เมื่อวันที่ 2 สิงหาคม 2550

การทำวิจัยครั้งนี้จะช่วยให้มีการสร้างสื่อที่มีประสิทธิภาพและช่วยสร้างเสริมสมรรถนะทางด้านการพยาบาลสูติศาสตร์ในนักศึกษาพยาบาลก่อนการเข้าสู่วิชาชีพจริง สื่ออิเลคทรอนิกส์อาจจะมีประโยชน์ต่อการนำไปสร้างเสริมความรู้และการตัดสินใจทางคลินิกสำหรับพยาบาลที่ทำงานด้านการผดุงครรภ์ตามสถานพยาบาลต่างๆ นอกจากนี้กระบวนการพัฒนาและประเมินคุณภาพสื่ออิเลคทรอนิกส์ในงานวิจัยครั้งนี้อาจเป็นแนวทางในการทำวิจัยเพื่อพัฒนาสื่อการเรียนการสอนในเรื่องอื่นๆต่อไป

ดิฉันจึงใคร่ขอความร่วมมือจากท่านในการเข้าร่วมวิจัยครั้งนี้ โดยกรุณาแสดงความคิดเห็นจากการประชุมกลุ่มในครั้งนี้ ข้อมูลที่ได้รับจากการศึกษาจะไม่ระบุชื่อและถูกปกปิดเป็นความลับ และข้อมูลจะถูกนำเสนอเป็นภาพรวม เพื่อใช้ในการเผยแพร่ให้เป็นประโยชน์ต่อไปเท่านั้น

ท่านมีสิทธิ์จะตอบรับหรือปฏิเสธการเข้าร่วมวิจัยครั้งนี้ได้ตามความสมัครใจ และถึงแม้ว่าท่านจะเข้าร่วมการวิจัยแล้วก็ตามท่านก็สามารถยกเลิกการเข้าร่วมวิจัยครั้งนี้ได้ตลอดเวลา โดยไม่มีผลใดๆเกี่ยวกับการวิจัยและการประชุมกลุ่ม ท่านสามารถสอบถามข้อมูลเพิ่มเติมได้ที่ผู้วิจัย

การแสดงความคิดเห็นและให้ข้อเสนอแนะของท่านมีคุณค่าอย่างยิ่งต่อการพัฒนาสื่อการเรียนการสอนที่มีประสิทธิภาพที่จะช่วยสร้างเสริมสมรรถนะของนักศึกษาพยาบาลให้เข้าสู่วิชาชีพได้อย่างเต็มศักยภาพ โดยเฉพาะอย่างยิ่งการสร้างเสริมสมรรถนะทางการผดุงครรภ์

ผู้วิจัยขอขอบพระคุณในความร่วมมือของท่านในการวิจัยครั้งนี้เป็นอย่างสูง

ผู้วิจัย

Protection of Human Subjects' Rights (Program implementation)

แบบพิทักษ์สิทธิ์ผู้เข้าร่วมวิจัย (ระยะทดลองใช้โปรแกรม)

สวัสดีค่ะ

ดิฉันนางศศิกานต์ กาละ ผู้ช่วยศาสตราจารย์ คณะพยาบาลศาสตร์ มหาวิทยาลัยสงขลานครินทร์ กำลังดำเนินการวิจัยเรื่อง การพัฒนาสื่ออิเลคทรอนิกส์เพื่อสร้างเสริมสมรรถนะความรอบรู้ทางการผดุงครรภ์ในนักศึกษาพยาบาลศาสตร์บัณฑิต โดยมีวัตถุประสงค์เพื่อสร้างสื่อที่มีประสิทธิภาพและสร้างเสริมสมรรถนะทางด้านการผดุงครรภ์ให้กับนักศึกษาพยาบาลก่อนเข้าสู่วิชาชีพพยาบาล

การวิจัยครั้งนี้เป็นส่วนหนึ่งของการศึกษาปรัชญาดุษฎีบัณฑิต และโครงการนี้ได้ผ่านการสอบโครงร่างวิทยานิพนธ์ คณะพยาบาลศาสตร์ มหาวิทยาลัยสงขลานครินทร์ เมื่อวันที่ 2 สิงหาคม 2550

การทำวิจัยครั้งนี้จะช่วยให้มีการสร้างสื่อที่มีประสิทธิภาพและช่วยสร้างเสริมสมรรถนะทางด้านการพยาบาลผดุงครรภ์ให้แก่ท่านในฐานะนักศึกษาพยาบาลก่อนการเข้าสู่วิชาชีพจริง สื่ออิเลคทรอนิกส์อาจจะมีประโยชน์ต่อการนำไปสร้างเสริมความรู้และการตัดสินใจทางคลินิกสำหรับท่านที่ทำงานด้านการผดุงครรภ์ตามสถานพยาบาลต่างๆ นอกจากนี้กระบวนการพัฒนาและประเมินคุณภาพสื่ออิเลคทรอนิกส์ในงานวิจัยครั้งนี้อาจเป็นแนวทางในการทำวิจัยเพื่อพัฒนาสื่อการเรียนการสอนในเรื่องอื่นๆต่อไป

ดิฉันจึงใคร่ขอเรียนเชิญผู้สนใจเข้าร่วมวิจัยครั้งนี้ โดยการเข้าร่วมการทดสอบสมรรถนะทางการผดุงครรภ์ การเรียนรู้ผ่านสื่ออิเลกทรอนิกส์ และร่วมกิจกรรมในกระบวนการเรียนรู้และการประเมินผล และดิฉันขอรับทราบผลการสอบใบประกอบวิชาชีพของท่านเพื่อนำมาวิเคราะห์ทางสถิติ ข้อมูลที่ได้จากท่านจะไม่ระบุชื่อและจะถูกปกปิดเป็นความลับ โดยจะนำเสนอเป็นภาพรวมเพื่อใช้ในการเผยแพร่ให้เป็นประโยชน์ต่อไป

ท่านมีสิทธิ์จะตอบรับหรือปฏิเสธการเข้าร่วมวิจัยครั้งนี้ได้ตามความสมัครใจ และถึงแม้ว่าท่านจะเข้าร่วมการวิจัยแล้วก็ตามท่านก็สามารถยกเลิกการเข้าร่วมวิจัยครั้งนี้ได้ตลอดเวลา โดยไม่มีผลใดๆ ต่อท่าน ท่านสามารถสอบถามข้อมูลเพิ่มเติมได้ที่ผู้วิจัย

การเข้าร่วมวิจัยครั้งนี้ มีคุณค่าอย่างยิ่งต่อการพัฒนาสื่อการเรียนการสอนที่มีประสิทธิภาพและจะช่วยสร้างเสริมสมรรถนะของนักศึกษาพยาบาลให้เข้าสู่วิชาชีพได้อย่างเต็มศักยภาพ โดยเฉพาะอย่างยิ่งการสร้างเสริมสมรรถนะทางการผดุงครรภ์

ดิฉันขอขอบคุณในความร่วมมือของท่านในการวิจัยครั้งนี้เป็นอย่างสูง

ผู้วิจัย

APPENDIX B

QUESTIONNAIRES OF THE PROGRAM

ชุดที่ 1

แบบสอบถามความเหมาะสมของโปรแกรม (Appropriateness Questionnaire)

คำชี้แจง: แบบสอบถามความเหมาะสมของโปรแกรมการเรียนรู้อิเลกทรอนิกส์ ทางการพยาบาลสูติศาสตร์ มีวัตถุประสงค์เพื่อประเมินความคิดเห็นของผู้ทรงคุณวุฒิเกี่ยวกับคุณภาพด้านการใช้งานของโปรแกรมการเรียนรู้ผ่านสื่ออิเลกทรอนิกส์ ทางการพยาบาลสูติศาสตร์ โปรดกาเครื่องหมาย / ในช่องความคิดเห็นด้านขวามือของแต่ละข้อคำถามที่ตรงกับความคิดเห็นของท่าน ซึ่งแบ่งความคิดเห็นเป็น 4 ระดับดังนี้

1 หมายถึง ควรปรับปรุง

2 หมายถึง เหมาะสมน้อย

3 หมายถึง เหมาะสม

4 หมายถึง เหมาะสมมาก

ข้อคำถาม	ระดับความเหมาะสมของโปรแกรม			
	เหมาะสมมาก (4)	เหมาะสม (3)	เหมาะสมน้อย (2)	ควรปรับปรุง (1)
1. ความเหมาะสมกับผู้เรียนทุกระดับสติปัญญา				
2. สนับสนุนการเรียนรู้แบบ active learning				
3. โปรแกรมมีความยืดหยุ่นในการใช้งาน……				
4……...				
5……...				
6……...				
7……...				
8……...				
9……...				

ข้อคำถาม	ระดับความเหมาะสมของโปรแกรม			
	เหมาะสมมาก (4)	เหมาะสม (3)	เหมาะสมน้อย (2)	ควรปรับปรุง (1)
10……...				
11……...				
12. การปฏิสัมพันธ์ระหว่างผู้เรียนและผู้สอน				
13. คุณภาพของโปรแกรมโดยรวม				

จุดเด่นของโปรแกรม

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จุดที่ควรพัฒนาของโปรแกรม

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ชุดที่ 2

แบบสอบถามความเหมาะสมต่อการใช้งานของโปรแกรม

คำชี้แจง: แบบสอบถามความเหมาะสมต่อการใช้งานโปรแกรมการเรียนรู้อิเลกทรอนิกส์ทางการผดุงครรภ์ มีวัตถุประสงค์เพื่อประเมินความคิดเห็นของนักศึกษาพยาบาลเกี่ยวกับความเหมาะสมในการใช้งานของโปรแกรมการเรียนรู้ผ่านสื่ออิเลกทรอนิกส์ทางการผดุงครรภ์ โปรดกาเครื่องหมาย / ในช่องความคิดเห็นด้านขวามือของแต่ละข้อคำถามที่ตรงกับความคิดเห็นของท่าน คำตอบของท่านไม่มีถูกหรือผิด ซึ่งความคิดเห็นแบ่งเป็น 4 ระดับดังนี้

1 หมายถึง ไม่เห็นด้วยอย่างยิ่ง

2 หมายถึง เห็นด้วยน้อย

3 หมายถึง เห็นด้วย

4 หมายถึง เห็นด้วยมาก

ข้อคำถาม	ระดับความเหมาะสม			
	เห็นด้วยมาก (4)	เห็นด้วย (3)	เห็นด้วยน้อย (2)	ไม่เห็นด้วยอย่างยิ่ง (1)
ด้านรูปแบบทั่วไปของโปรแกรม 1. รูปแบบของโปรแกรมน่าสนใจ				
2. มีการนำเสนอหลายรูปแบบ				
3. รูปแบบโปรแกรมใช้งานง่าย				
4……....				
5……....				
6……....				
7……....				

ข้อคำถาม	ระดับความเหมาะสม			
	เห็นด้วยมาก (4)	เห็นด้วย (3)	เห็นด้วยน้อย (2)	ไม่เห็นด้วยอย่างยิ่ง (1)
ด้านเนื้อหา 1. เนื้อหามีความครอบคลุมสอดคล้องกับวัตถุประสงค์				
2……....				
3……....				
4……....				
5……....				
6……....				
ด้านแบบทดสอบ 1. แบบทดสอบกระตุ้นความสนใจผู้เรียน				
2……....				
3……....				
4……....				
5……....				
6……....				
ด้านกิจกรรมการเรียนรู้ 1. กิจกรรมการเรียนรู้มีหลากหลายรูปแบบ				
2……....				
3……....				
4……....				

ข้อคำถาม	ระดับความเหมาะสม			
	เห็นด้วยมาก (4)	เห็นด้วย (3)	เห็นด้วยน้อย (2)	ไม่เห็นด้วยอย่างยิ่ง (1)
5……...				
6……...				
7……...				
8……...				
9……...				
10……...				
11……...				
12……...				
ด้านความคุ้มค่า				
1. การเรียนรู้ในรายวิชานี้มีประโยชน์คุ้มค่ากับเวลา				
2……...				
3……...				

จุดเด่นของโปรแกรม

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จุดที่ควรพัฒนาของโปรแกรม

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ข้อเสนอแนะอื่นๆ

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Comprehensive Midwifery Competency Testing

แบบประเมินสมรรถนะทางด้านการผดุงครรภ์

คำชี้แจง: จากคำถามต่อไปนี้ ขอให้ท่านเลือกตอบเพียงคำตอบเดียวในแต่ละข้อ คำถามมีทั้งหมด 130 ข้อ

1.ในกรณีที่มี internal rotation สมบูรณ์ รอยต่อแสกกลางของศีรษะทารกมีความสัมพันธ์กับแนวช่องเชิงกรานอย่างไร

ก. ขวาง ข. เฉียงขวา

ค. เฉียงซ้าย ง. หน้า-หลัง

2. ข้อใดเป็นกลไกการคลอดทารกท่า LOA ที่ต่อเนื่องจากการคลอดศีรษะทารก

ก. descent ข. flexion

ค. restitution ง. extension

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130. หญิง G5P4 หลังคลอดทารก น้ำหนัก 3,200 กรัม พยาบาลวัด สัญญาณชีพทุก 15 นาที จนถึง 45 นาทีหลังคลอด มดลูกหดรัดตัวดี มีเลือดออกจากช่องคลอดประมาณ 30 ซีซี เมื่อครบ 1 ชม. หลังคลอด พยาบาลพบว่ามีเลือดสีแดงซึมชุ่มผ้าถุงและผ้ารองก้น มดลูกลอยกลมโตเหนือสะดือ พยาบาลควรทำกิจกรรมใดเป็นลำดับแรก

ก. วัดความดันโลหิต ข. คลึงยอดมดลูกทันที

ค. ดูแลให้ IV fluid ง. นำ bed pan มาให้ถ่ายปัสสาวะ

APPENDIX C

E-LERNING MODULES

Overview of the E-Learning Modules

The following figures are presented the overview of the e-learning course modules as the examples:

Figure 5. Logging in to the e-learning course

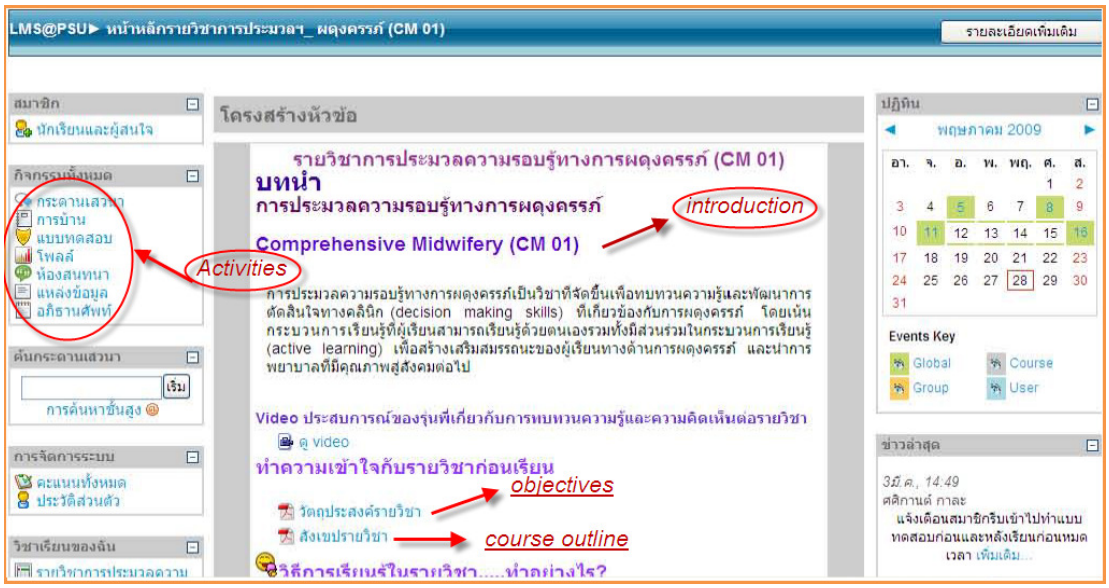

Figure 6. Main page of comprehensive midwifery course

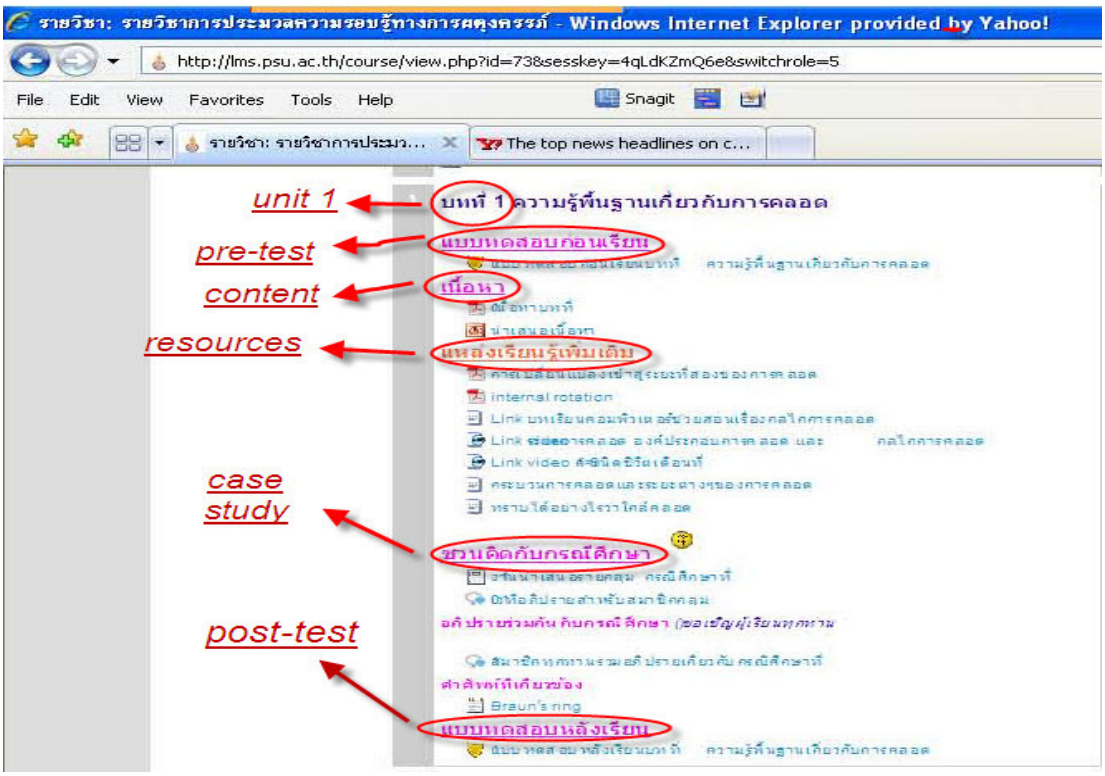

Figure 7. The structure of learning modules

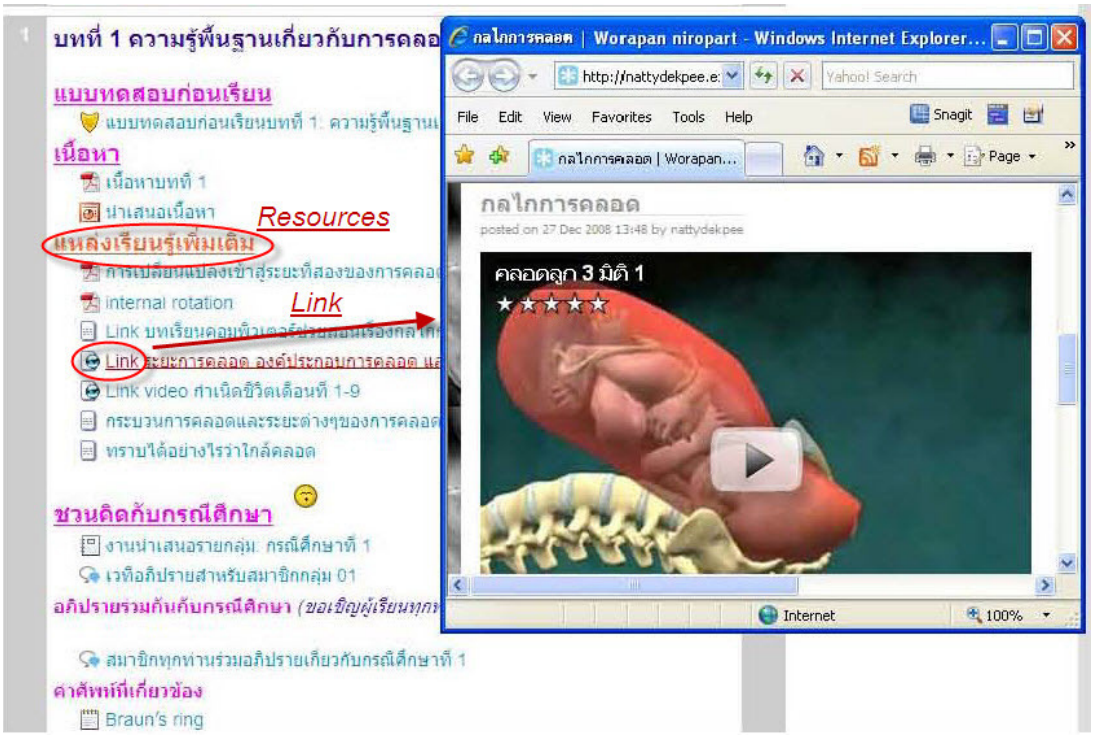

Figure 8. Link to extended resource

Screen pages of course instruction, communication, content, and quizzes.

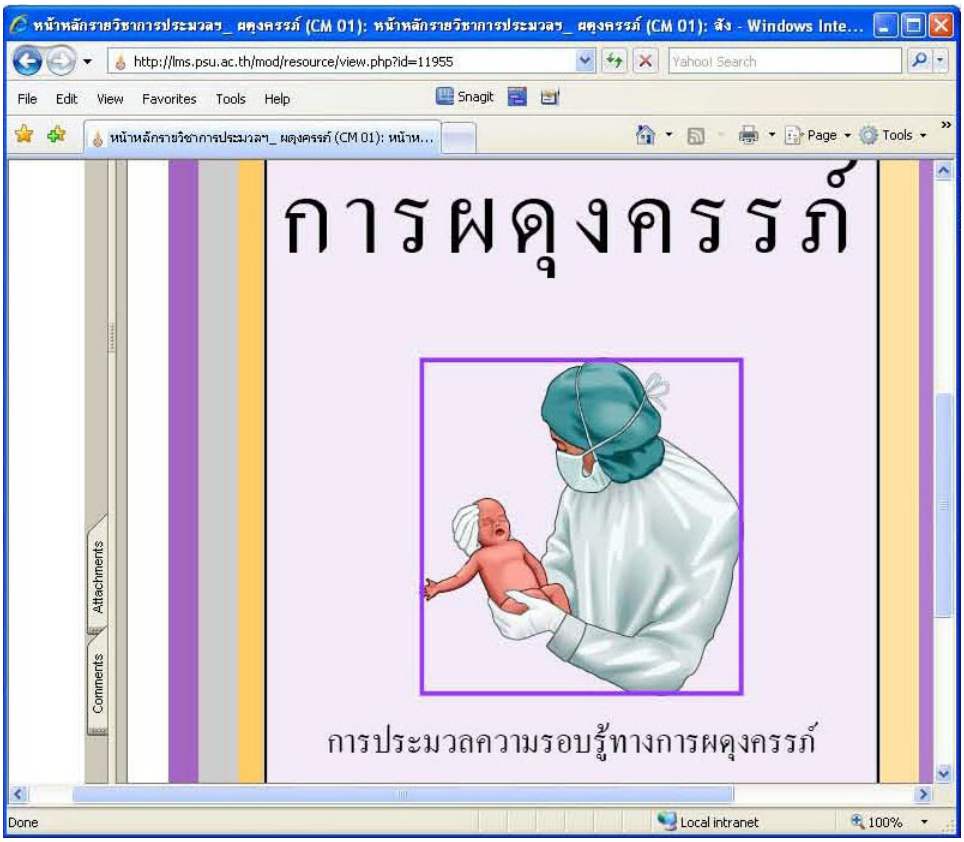

Figure 9. Course instruction

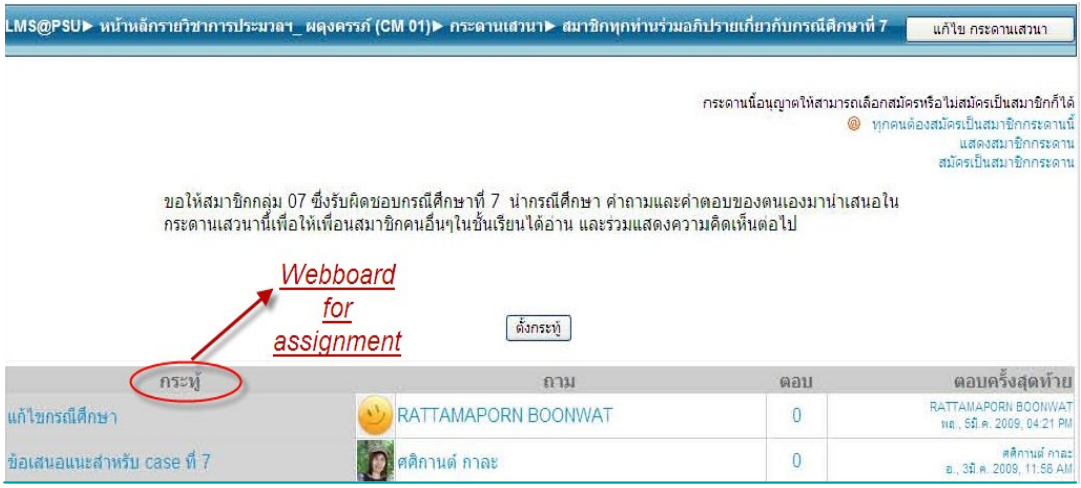

Figure 10. Course communication

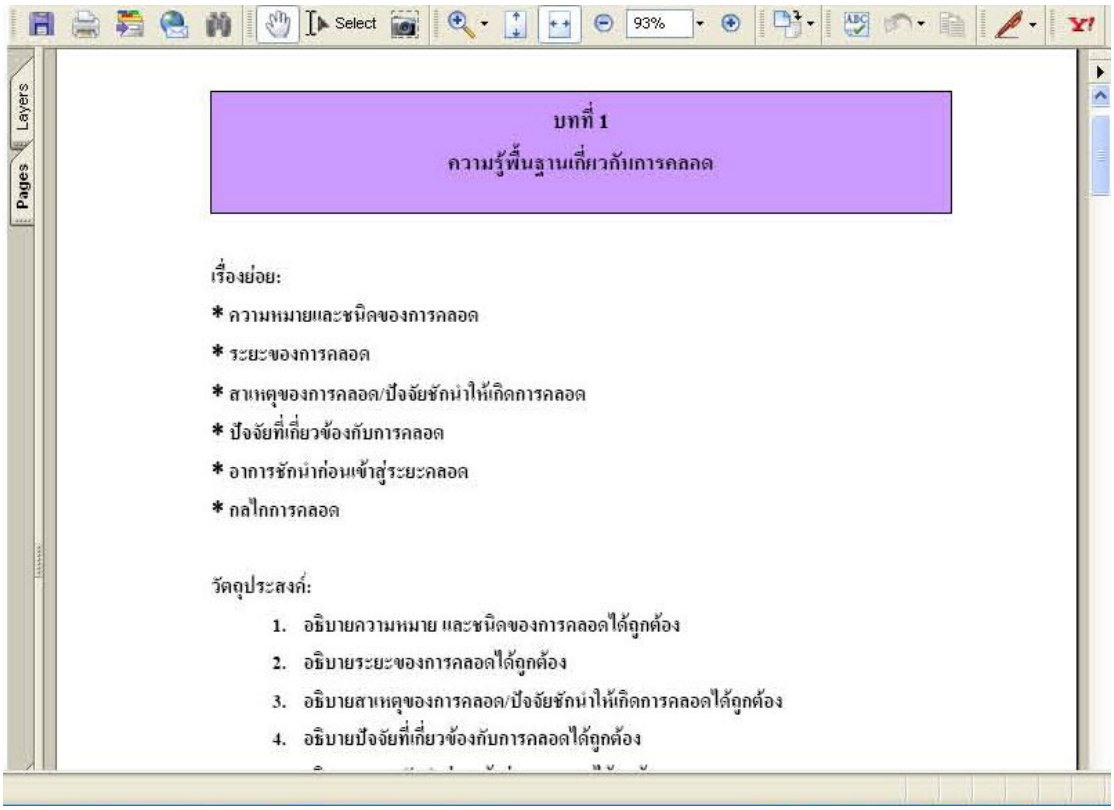

Figure 11. Course content 1 (pdf file-first page)

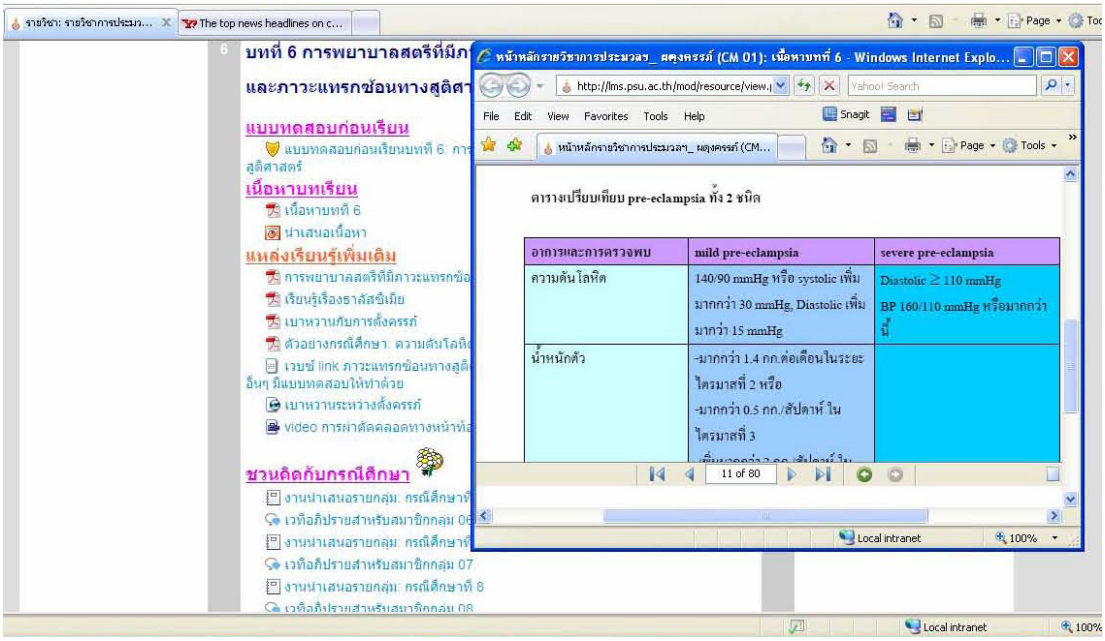

Figure 12. Course content 2 (pdf. file)

Figure 13. Course content 3 (ppt. file)

Figure 14. Course content 4 (ppt. file)

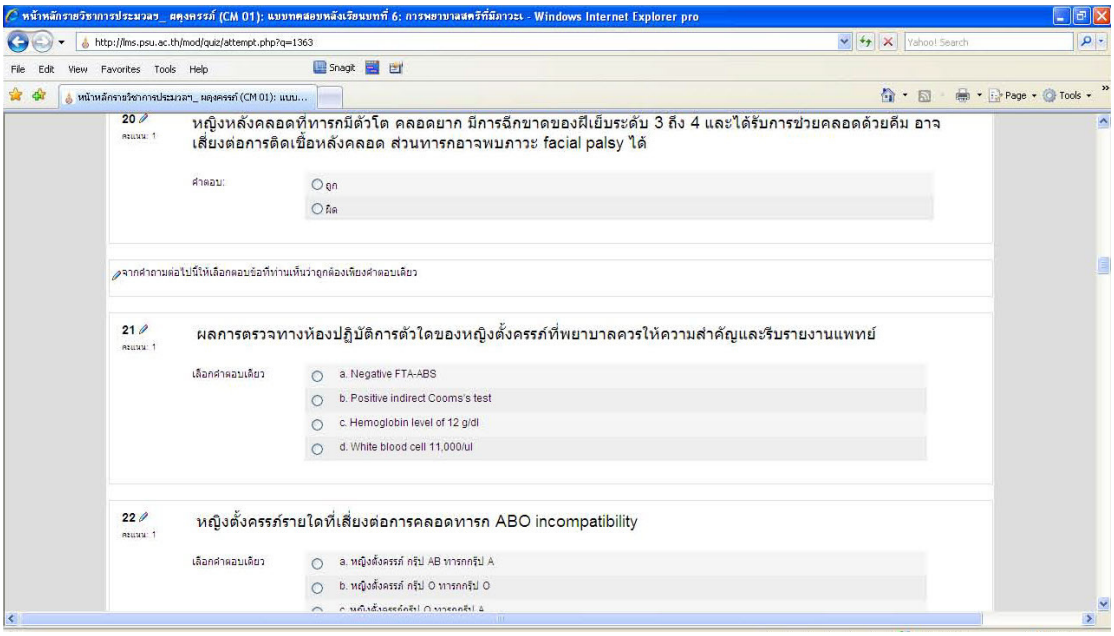

Figure 15. Course quizzes- true/false and multiple choices

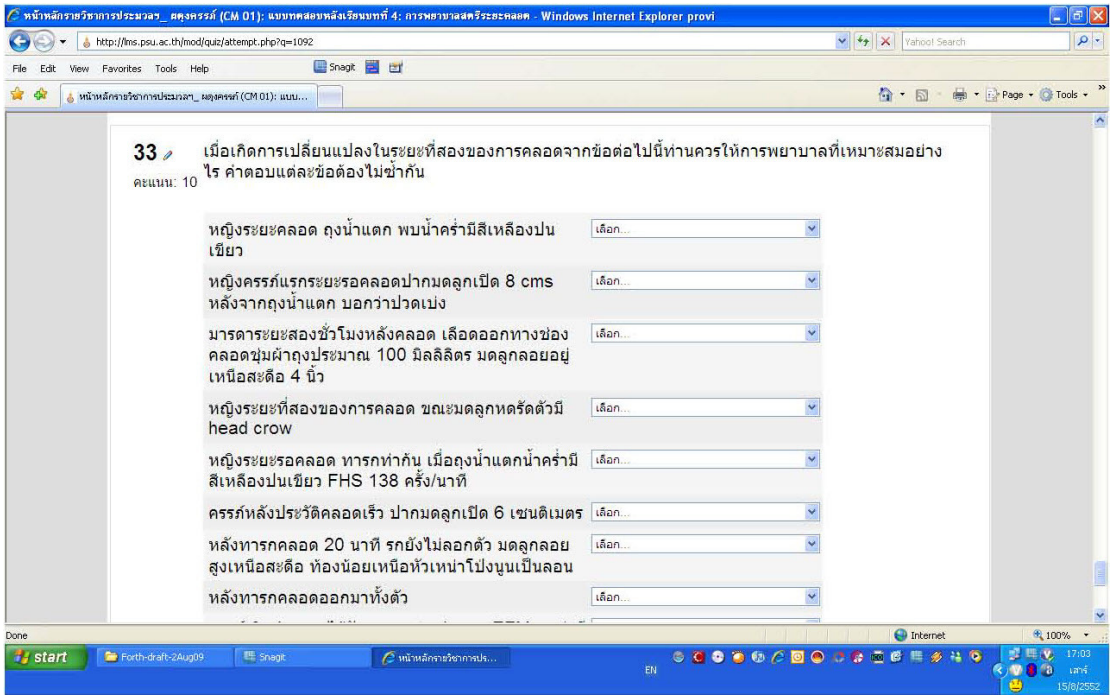

Figure 16. Course quizzes-matching

APPENDIX D

TABLE: PARTICIPANTS' SATISFACTION TO THE PROGRAM

Participants' Satisfaction to the Program

Table 11

Frequency of Students, Classified by Level of Satisfaction, Mean and Standard Deviation of Satisfaction Scores of Five Components (N = 36).

Satisfaction	Frequency & Level of satisfaction				Mean	SD
	1	2	3	4		
Component 1: Program format (7)						
1. Interesting……..			15	21	3.58	.50
2. Multiple presentation styles…			17	19	3.53	.51
3. Easy to use…….		2	20	14	3.33	.59
4. Encouraging self directed learning			11	25	3.69	.47
5. Facilitating active learning			25	11	3.31	.47
6. Supporting communication …...		7	21	8	3.03	.65
7. You are satisfied…….			22	14	3.39	.49
Component 2: Content (6)						
8. Relevant to objectives…….			21	15	3.42	.05
9. More comprehension……..		1	15	20	3.53	.56
10. Gained more knowledge….		1	12	23	3.61	.55
11. Clinical decision-making skills			26	10	3.28	.45
12. Learning resources ……			20	16	3.44	.50
13. You satisfied ……..			15	21	3.58	.50
Component 3: Quizzes (6)						
14. Attractive…….			21	15	3.42	.50
15. Self assessment…….			12	24	3.67	.48
16. Review…….			10	26	3.72	.45
17. Enhance knowledge……			14	22	3.61	.49
18. Enhance competency……			16	20	3.56	.50
19. You satisfied…….			17	19	3.53	.51

Table 11 (continued)

Satisfaction (items)	Frequency & Level of satisfaction				Mean	SD
	1	2	3	4		
Component 4: Activities (12)						
20. Several learning activities ...		2	17	17	3.42	.60
21. Knowledge sharing……...		7	21	8	3.03	.65
22. Instructor facilitating…….		2	20	14	3.33	.59
23. Communicate with the instructor……	1	5	20	10	3.08	.73
24. Assignment ……		5	24	7	3.06	.58
25. Active learning……		1	24	11	3.28	.51
26. Interesting…….		1	20	15	3.39	.55
27. Case studies……...	1	3	24	8	3.08	.65
28. Self directed learners……			18	18	3.50	.51
29. Case studies and clinical decision-making skills…..		3	24	9	3.17	.56
30. Boring… (reversed scores)		4	26	6	3.06	.53
31. You satisfied…..			24	12	3.33	.48
Component 5: Significance (3)						
32. Useful and worthwhile…..			21	15	3.42	.05
33. The length of time……	1	5	24	6	2.97	.65
34. Recommend others…..			20	16	3.44	.50

APPENDIX E

ASSUMPTION TESTINGS AND COMPARESON OF PERSONAL DATA

Test of Normal Distributions

E-learning group (n = 36).

One-Sample Kolmogorov-Smirnov Test

		pretest score	posttest score
N		36	36
Normal Parameters[a,b]	Mean	86.9167	93.2500
	Std. Deviation	9.7523	9.1881
Most Extreme Differences	Absolute	.094	.082
	Positive	.093	.067
	Negative	-.094	-.082
Kolmogorov-Smirnov Z		.564	.489
Asymp. Sig. (2-tailed)		.908	.971

a. Test distribution is Normal.

b. Calculated from data.

Control group (n = 41)

One-Sample Kolmogorov-Smirnov Test

		pretest score	posttest score
N		41	41
Normal Parameters[a,b]	Mean	84.1463	84.7561
	Std. Deviation	8.7280	9.3589
Most Extreme Differences	Absolute	.073	.075
	Positive	.071	.044
	Negative	-.073	-.075
Kolmogorov-Smirnov Z		.470	.478
Asymp. Sig. (2-tailed)		.980	.977

a. Test distribution is Normal.

b. Calculated from data.

Test of Homogeneity of Variances

T-Test

Group Statistics

	code of group	N	Mean	Std. Deviation	Std. Error Mean
posttest score	intervention	36	93.2500	9.1881	1.5314
	control	41	84.7561	9.3589	1.4616

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
posttest score	Equal variances assumed	.032	.858	4.008	75	.000	8.4939	2.1195	4.2717	12.7161
	Equal variances not assumed			4.012	74.046	.000	8.4939	2.1169	4.2759	12.7119

Comparison Between Personal Data of Drop-out (n = 31) and Persistent Participants (n = 77)

Group Statistics

	participants	N	Mean	Std. Deviation	Std. Error Mean
age	include	77	22.4286	.7683	8.755E-02
	motality	31	22.2903	.4614	8.287E-02
GPA	include	77	3.0751	.2810	3.202E-02
	motality	31	2.9855	.2513	4.514E-02
anxiety of national exam	include	77	3.1039	.8043	9.166E-02
	motality	31	3.1935	.7033	.1263
pretest score	include	77	85.4416	9.2644	1.0558
	motality	31	83.0645	6.6830	1.2003

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
age	Equal variances assumed	5.484	.021	.935	106	.352	.1382	.1479	-.1550	.4315
	Equal variances not assumed			1.147	90.055	.255	.1382	.1206	-.1012	.3777
GPA	Equal variances assumed	.017	.897	1.543	106	.126	8.958E-02	5.805E-02	-2.55E-02	.2047
	Equal variances not assumed			1.619	61.633	.111	8.958E-02	5.534E-02	-2.11E-02	.2002
anxiety of national exam	Equal variances assumed	.698	.405	-.542	106	.589	-8.965E-02	.1653	-.4174	.2381
	Equal variances not assumed			-.574	63.017	.568	-8.965E-02	.1561	-.4015	.2222
pretest score	Equal variances assumed	3.329	.071	1.298	106	.197	2.3770	1.8320	-1.2551	6.0091
	Equal variances not assumed			1.487	76.340	.141	2.3770	1.5986	-.8065	5.5606

APPENDIX F

LIST OF EXPERTS

LIST OF CONTENT VALIDITY EXPERTS

Three Experts of Appropriateness Questionnaire and Satisfaction Questionnaire Validation

Assistant Professor Wasant Atisabda, Department of Educational Technology Faculty of Education, Prince of Songkla University (Pattani Campus)

Assistant Professor Jirapan Peeravud, Department of Administration of Nursing Education and Nursing Service, Faculty of Nursing, Prince of Songkla University

Assistant Professor Sittichoke Anuntaseree, Department of Orthopaedic Surgery and Physical Medicine, Faculty of Medicine, Prince of Songkla University

Five Experts in Content of Program Modules Validation

Associate Professor Sureeporn Kritcharoen, Department of Obstetrics, Gynecology and Midwifery, Faculty of Nursing, Prince of Songkla University

Associate Professor Dr. Jeranoun Thassri, Department of Obstetrics, Gynecology and Midwifery, Faculty of Nursing, Prince of Songkla University

Assistant Professor Pranee Pongpaiboon, Department of Obstetrics, Gynecology and Midwifery, Faculty of Nursing, Prince of Songkla University

Assistant Professor Kanjanee Phon-in, Department of Obstetrics, Gynecology and Midwifery, Faculty of Nursing, Prince of Songkla University

Assistant Professor Dr. Sopen Chunuan, Department of Obstetrics, Gynecology and Midwifery, Faculty of Nursing, Prince of Songkla University

Three Experts of Program Appropriateness Verification

Assistant Professor Wasant Atisabda, Department of Educational Technology Faculty of Education, Prince of Songkla University (Pattani Campus)

Assistant Professor Jirapan Peeravud, Department of Administration of Nursing Education and Nursing Service, Faculty of Nursing, Prince of Songkla University

Sugree Weovannajit, Department of General Science, Faculty of Science, Prince of Songkla University

VITAE

Name Mrs. Sasikarn Kala

Students ID 4858004

Educational Attainment

Degree	Name of Institution	Year of Graduation
Bachelor of Science (Nursing and Midwifery)	Boromarajonnani College of Nursing, Suratthani	1992
Bachelor of Public health (Public health)	Sukhothai Thammathirat University	1994
Master of Nursing Science (Maternity and Newborn)	Ramathibodi School of Nursing, Mahidol University	2001

Scholarship Awards During Enrolment

Predoctoral scholarship, the Commission of Higher Education, Ministry of Education, the Royal Government of Thailand

Work-Position and Address

Assistant Professor, Department of Obstetric-Gynecology Nursing and Midwifery, Faculty of Nursing, Prince of Songkla University

List of Publication and Proceedings

Kala, S., Isaramalai, S., & Pohthong, A. (2009). Electronic learning and constructivism: A model for nursing education [Electronic version]. *Nurse Education Today*, Article in-press, corrected proof, Retrieved July 1, 2009 from http://www.sciencedirect.com/science/article/.

Kala, S., Isaramalai, S., & Pohthong, A. (2009, May 16). *Electronic learning and constructivism: A model for designing effective learning experiences.* Paper presented at the international conference on graduate students' research work: A joint conference between the Faculty of Liberal Arts, Prince of Songkla University and the Malaysia National Writers Association (PENA), Songkhla, Thailand.