Development of Computer Assisted Instruction (CAI) integrated with 3D animation on Mechanism of labor for nursing students.

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ABSTACT

This study designed to develop a computer assisted instruction (CAI) on mechanism of labor for nursing students. The computer assisted instruction was developed based on integrating with three dimensional animations presentation and principle of mechanism of labor. The objectives were to develop and evaluate the computer assisted instruction and compare the knowledge on mechanism of labor between an experimental group and a control group. The control group received the traditional teaching while the experimental group received the computer assisted instruction. The results gain that using computer assisted instruction enhanced knowledge of the learners in comparison to traditional lectures.

Index Terms*-computer assisted instruction, 3D, mechanism of labor*

1. INTRODUCTION

Understanding factors affecting the process and mechanism of labor is one of the important principles for providing care for childbearing women either in normal or abnormal deliveries (Pillitteri, 2007). The most exciting and anxious time for parturient woman is labor and birth, however the new nursing student is also. Nursing students need to understand the process and mechanism of labor. They also have to know how to prevent risk factors which can happen anytime. The mechanism of labor is difficult for nursing students, especially, Thai nursing students who acquire such knowledge mainly from lecture and tutorials, which cannot provide adequate understanding (Sailom, 2009). A study based on textbook or with a static plastic model due to inadequate in budget and staff. Moreover, as the labor mechanism process is unseen it can be understood easier if nursing students are able to use their imagination.

To solve some problems which occur during traditional teaching and studying, the computer assisted instruction is recognized as a useful tool to supplement or replace traditional classroom practice. Supplement with a computer assisted learning unit of vital signs has been shown to enhance performance skills in vital sign assessment of nursing students (Kaveevichai et al., 2009). Computer assisted instruction (CAI) is an individualized method of self study using the computer to deliver an education activity. It allows learners to proceed at their own place with immediate and continuous feedback on their progress as a response to a software program (Deyoung, 2003). The use of CAI multimedia as a supplement to traditional classroom lectures produced was shown to provide a significant improvement in the performance of students in comparison to when either strategy was used alone (Rouse, 2000). In addition, most nursing students who have studied via an online course on basic critical care can meet the entire competency requirements.

Moreover, 3D animation is the key to enrich learning attention, which can be combined with knowledge content and animations. This is based on concepts that the picture will simulate things that are physically unseen and can therefore be understood easier. While the labor process can be seen outside the vagina, the mechanism of labor cannot be seen in the same way. Furthermore the content is quite difficult and complex to understand, so the learner might misunderstand and may not imagine the process correctly. The mechanism of labor should be made in 3D animation to help the learner understand the content. Similar to the findings of Ribbon (1998) this study suggested that the use of clinical pictures, animations, and video was popular partly because there are features that textbooks and lecture notes could not provide.

The aim of this study to developing computer assisted instruction on mechanism of labor is presented by using three dimension picture and animation from computer 3D animation program

The research questions are as follows:

- What effects of CAI on mechanism of labor on knowledge of nursing students?
- What are the attitudes of students toward the CAI?

2. LITERATURE REVIEW

According to the principles of CAI, lessons were designed by developing a computer program for educational purposes with the computer as the medium for conveying knowledge to learn via multimedia techniques with special characteristics in order to transmit the content in a way that closely resembles actual events, which is effective in drawing attention and motivating learners to study (Billing, 1986).
Results from several studies have suggested that the learner preferred sensory processing modes: visual, auditory, or motor manipulation (Kenny, 2002)

Suwuttho (2000) studied "The effectiveness of using computer assisted instruction (CAI) subject on "Medical Platy helminthes" to support self studying of the third year medical students, Faculty of Medicine, Siriraj Hospital, Mahidol University", showing that CAI was effective and increased learning efficiency with statistical significance.

Lawdermilk and Fishel (1991) studied the use of computer assisted instruction to assess the decision making skills of nursing students in their senior year of bachelor degree studies in nursing. The results showed that the students who had studied with CAI had better decision-making skills than students who had not used CAI. Furthermore, these students were able to improve their grades and most felt positively toward CAI.

However, course preparation for online learning tasks takes much more time and may need professional computer programmers. There are concerns that some students in online learning need better self discipline and computer skills. They may also feel disconnected from their class members (Kenny, 2002).

3. METHODOLOGY

The computer assisted instruction on mechanism of labor was developed, evaluated and then compared with the knowledge on mechanism of labor between an experimental group and a control group. The participants were eighty second year nursing students, Faculty of Nursing, Chiangmai University and they were equally divided into a control group and experimental group using simple random sampling. The control group received the traditional teaching while the experimental group received the computer assisted instruction.

The CAI consisted of three units. The first unit reviews basic knowledge about types of pelvis and the fetal skull composed of fetal bones in the form of 2D and 3D animation. The second unit describes the definition and mechanism of normal labor. Unit 3 shows the steps of the mechanism of normal labor, using 3D animation of mechanism which including

The movement in upper zone of passage:

- Engagement
- Flexion
- Descent

The movement in lower zone of passage:

- Internal rotation
- Extension

The movement which is out of passage:

- Restitution
- External rotation
- Expulsion

At the end of each unit, students were encouraged to assess their understanding by doing exercises in difference kinds of test such as multiple choices, drag and drop and fill in the blanks.

The CAI was developed by Adobe Flash, which was used to create a web interface. It is a multimedia platform used to add animation, video, and interactivity to Web pages. Flash is frequently used for advertisements and games. More recently, it has been positioned as a tool for "Rich Internet Applications" ("RIAs").

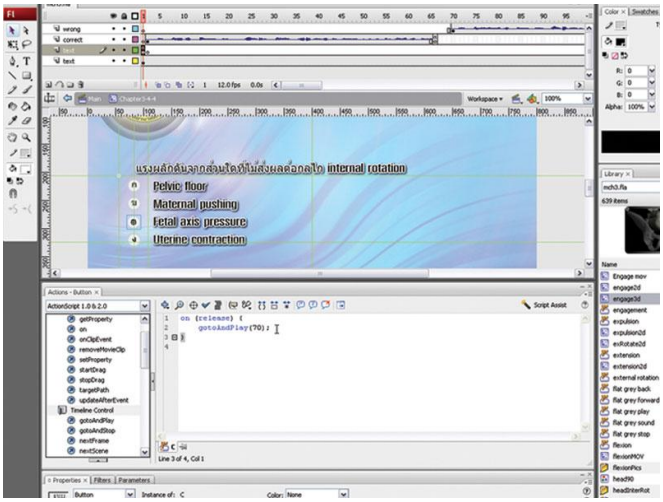

Figure 1. image of developing multiple choices by using action script with Adobe Flash software

The 2D graphics and animations were made using Adobe Flash, and also the exercises. Action script was used to develop an animation controller and targeting menus.

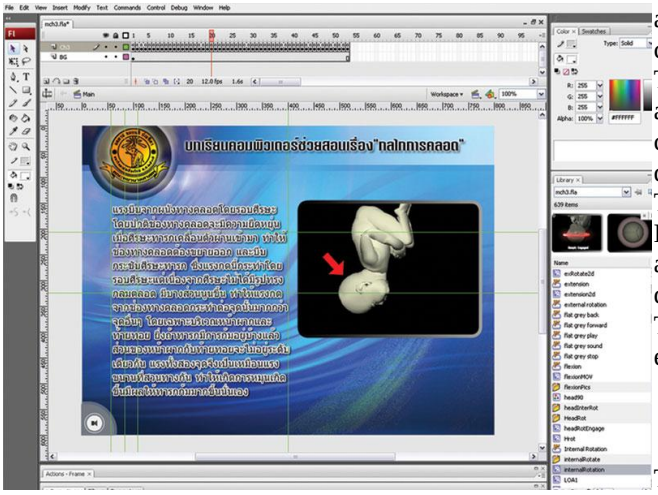

Figure 2. image of creating contents layout by mixing text and animation with Adobe Flash software

The 3D model and animation were created by Autodesk Maya, which is a software application used for 3D animation, 3D modeling, simulation, visual effects, rendering, matchmoving, and compositing. Maya is used in the film and TV industry, as well as for computer and video games, architectural visualization and design. The baby was modeled by polygons then rigging and animating. Finally, it was rendered as a still image then exported to make movie clips with Adobe Flash.

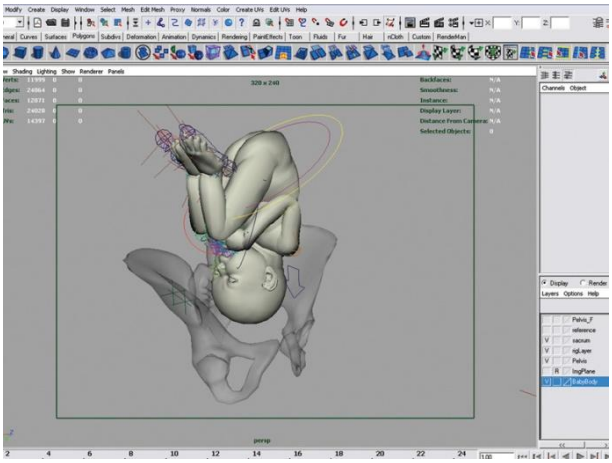

Figure 3. image of developing 3D modeling and character rigging with Autodesk Maya software

4. ASSESSMENT

The participants of this study were second year nursing students. They were divided into two groups: control group (40 students) and experimental group (40 students). Most participants (97.5%, n=40) were female; with mean age of 20.82 years and grade point average (GPA) of 3.06. Students' experience in using computer was 52.5%. The control group received only lectures and tutorials while the experiment group received computer assisted instruction.

The research instruments composed of a teaching plan and the computer assisted instruction program. The collected data composed of a demographic questionnaire. These instruments were validated.

The questionnaire comprised 15 items using 5-point Likert-scale ranging 1 (strongly disagree) to 5 (strongly agree). It was divided into three categories: content design, Interface design and usability, exercises design. The questionnaire was validated by three experienced educators.

5. RESULTS

The results in table 1 show the mean score of knowledge on mechanism of labor between pre test and post test. In the experimental group there was a significant difference (t=-4.73, p<.001).

Table1. Comparison of the mean of the experimental group of labor mechanism knowledge test

	Before study with CAI			After study with CAI			t
	Min-max	Mean	S.D.	Min-max	Mean	S.D.	
Score	0-3	1.60	0.78	4-9	6.60	1.15	-4.73

The results in table 2 show no significant difference in the pre-test score on the factual knowledge between the experimental group and control group. However, the post-test scores in the experimental group were higher than control group (p<.05).

Table2. Comparison the mean of pre-test and post-test scores between experimental group and control group

	Experimental GRP			Control GRP			t
	Min-max	Mean	S.D.	Min-max	Mean	S.D.	
Score Pre-test	0-3	1.60	0.78	0-3	1.45	0.78	0.86
Score Post-test	4-9	6.60	1.15	2-8	5.63	1.53	-2.59

6. DISCUSSION

The study clearly demonstrated that computer assisted instruction with 3D animation improved nursing students' learning achievement on the process mechanism of labor. The 3D animation and interactive features in multimedia gain more interest and clarify contents for students. A result after students studied on CAI, a significant increase of post-test score for experimental group. Similar results were found by Sailom (2009), most of the student in the experimental group were satisfied with their web-based learning experiences. The relationship between the post-test scores and time spent on the web-based learning and the satisfaction scores suggested that the web-based unit helped increasing students' conceptual understanding,

especially, for those who liked the web and accessed it more often than others.

7. LIMITATIONS AND RECOMMENDATIONS

The limitations of computer system and network infrastructure are speed of connection and computer virus. These potentially slowdown the system or obstruct the learning activities. For the contents development in 3D animation, developer must clearly understand the process of mechanism of labor, otherwise the animation movement will be going to the wrong position. Furthermore, great care has to be taken for character rigging techniques.

8. CONCLUSION

Computer assisted instruction was developed for second year undergrad nursing students. The students were divided into two groups which were an experimental group and a control group. It was found that this integrated interactive multimedia with 3D animation and audio enhanced their performance skills. It also indicated that using computer assisted instruction enhanced the knowledge of learners. It can be used instead of the traditional teaching. If they are both used, the learning process will be more effective. Also, it will be an alternative study medium to improve self directed learning for lifelong learning.

9. ACKNOWLEDGEMENTS

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