The Development of a Computer Assisted Instruction Package with Tutorial Through E-Learning on Computer Technology Curriculum

Wanida Singhatham[*], and Ubolwan Intrapunya.
Department of Computer Technology, Faculty of Science and Technology,
Rajamangala University of Technology Phra Nakhon 10300
*Corresponding Author : wanida.si@rmutp.ac.th

Abstract

The purposes of the research were to design and develop a computer assisted instruction package with tutorial through e-learning on computer technology curriculum and to find out efficiency, effectiveness and learners' satisfaction towards the package. The research tools are 1) the Computer Instruction Package on Database Management System Subject, 2) Achievement evaluations, 3) Quality assessment and evaluation form for multimedia software and 4) Questionnaire of learners' satisfaction. The research results reveals that the efficiency of the Computer Instruction Package was at 82.50/82.56, corresponding with 80/80 criteria. The analysis of pre-test and post-test scores finds that the effectiveness after the process (Epost) was at 82.56, which was higher than one tested before the process (Epre) which was at 14.62. Therefore the Computer Instruction Package on Program Design and Development could increase the students learning effectiveness up to 67.94, corresponding with 60 criteria. The Mean of satisfaction of the sampling groups was rather at a high level (4.28). It could be concluded that the Computer Assisted Instruction Package with tutorial through e-learning on computer technology curriculum had the efficiency that could used for self study.

Key words: Computer Assisted Instruction Package with tutorial / e-learning / Efficiency /

Learning Effectiveness / Satisfaction

1. Introduction

Today E-Learning is a learning method that plays the important role in every country's education reform because it gives learner opportunities to access to knowledge ubiquitously: Anywhere-Anytime Learning. Learners can manage to how and what to learn by themselves: Self-Pace learning, according to their interests and aptitudes. E-Learning is considered an abundant source of data comprising various types of materials such as texts, images, animations, simulations, audio and video sequences, peer and expert discussion groups, and online mentoring. As a result, it helps create the culture of learning community or organization which enhances learners to interact with information and data initiating knowledge development and innovation as mentioned above. This, therefore, is the basis for conducting this study to find out the difference between individuals, decrease time limitation in typical classroom learning, and promote learners to achieve each curriculum's objectives.

2. Materials and Methods

2.1 Materials

2.1.1 Computer Teaching Material Development on Internet, related subjects, database management system on the issue of 'Normalization'.

2.1.2 Development on Learning Achievement Evaluation

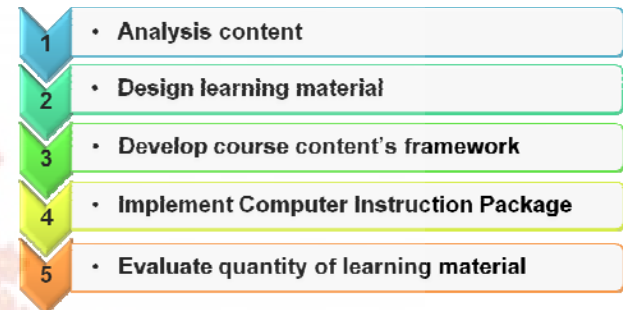2.1.3 Development on Multimedia Evaluation

2.1.4 Development on Satisfaction Evaluation

2.2 Methods

2.2.1 Population and Subjects of the Study: 2nd year students from Computer Technology Program, the Faculty of Science and Technology, Rajamangala University of Technology Phra Nakhon. The total number is 50.

2.2.2 Computer Teaching Material Development: by using the process of developing computer teaching material of IMMCIP (Interactive Multimedia Computer Instruction Package). The process comprises of 5 stages as follows:

1 • Analysis content
2 • Design learning material
3 • Develop course content's framework
4 • Implement Computer Instruction Package
5 • Evaluate quantity of learning material

2.2.3 Development on Learning Achievement Evaluation: using Pre-Test and Post-Test

2.2.4 Development on Multimedia Evaluation: using Rating Scale following Likert's Scale Type

2.2.5 Development on Satisfaction Evaluation: using Rating Scale following Likert's Scale Type

2.2.6 Data Analysis Method and Statistics

• **Learning Material Effectiveness Evaluation:** can be done by conducting Pre-Test with learners. Collected data will be analyzed. Score of 30% or over will be cut off whereas that of less than 30% is considered for studied subjects for this evaluation of learning achievement and effectiveness. The total number of subjects is 39. Then the subjects are required to learn from the computer assisted learning material and later do the test of each learning unit until all units are accomplished before doing the Post-Test. Finally, collected test data is to be analyzed by using the following formula. See figure 1.
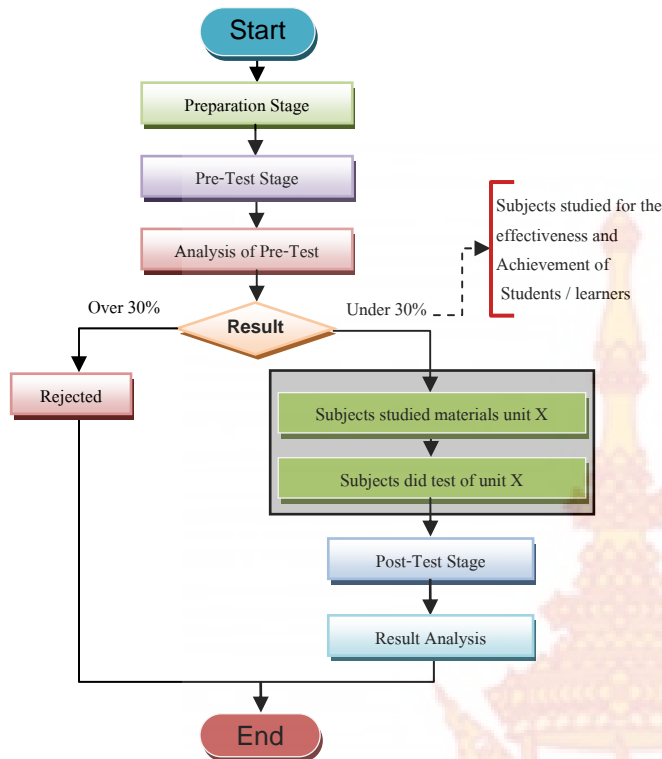
Figure 1 shows the process of the evaluation of the effectiveness of learning material and the achievement of the learning

The formula to calculate for the effectiveness of learning material

= **E₁ : E₂**

$$E_1 = \frac{\sum_{i=1}^{M} E_{li}}{M} \qquad E_2 = \frac{\left(\sum_{i=1}^{N} x_i / N\right) x100}{B}$$

E₁ Means the effectiveness of learning process calculated from the score of each unit test

E₂ Means the effectiveness of Post-Test score after studying all units

E_{li} **Means** the efficiency of during test score of each unit that calculated from the percentage of average scores from Post-Test of sub-units of all students.

Formula
$$E_{li} = \frac{\sum_{J=1}^{N} x_j}{NA_i} x100$$

X_j =   Total scores of students j between study unit i

A_i =   Score of the unit test i

B = Score of the test after lesson or Post Test

N =   Total number of students

M = Total number of sub-units in subjects

- **The evaluation of learning achievement** was done by comparing scores from Post- Test with Pre-test by using the following formula.

The formula to calculate for learning achievement = **Epost– Epre ≥ 60**

Formula
$$E_{post} = \frac{\sum_{i=1}^{N} X_i}{NB} x100$$

Epost Means the effectiveness of Computer Assisted Instruction Package after learning calculated from the percentage of totaled score from all unit tests or the percentage of Post-Test score = E2

X_j = Post-test scores of students i

N = Total number of students

B = Total score of Post-test

Formula
$$E_{pre} = \frac{\sum_{k=1}^{N} X_k}{NC} x100$$

E_{pre} **Means** the effectiveness of learner before learning calculated from Pre-Test score

X_j = Pre-test scores of students i

N = Total number of students

C = Total score of Pre-test

3. Results and discussion

3.1 Results of the evaluation of the effectiveness of learning material

The research results reveals that the efficiency of the Computer Instruction Package (E_1/E_2) was at 82.50/82.56, corresponding with 80/80 criteria. See details in Table 1-3.

Table 1 shows the evaluation of the effectiveness of learning material during learning process

Unit	Totaled score of unit	Totaled unit score of 39 students	The effectiveness of learning material during learning process of each unit (E_{1i}) in percentage
1	780	641	82.18
2	1170	969	82.82
The effectiveness of learning material during learning process (E_1)			**82.50**

Table 2 shows the evaluation of the effectiveness of learning material before learning process

Description	Number
Number of students	39
Total Pre-Test score	285
Totaled Pre-Test score of learners	1,950
The effectiveness of learning material before learning process(E_{pre})	**14.62**

Table 3 shows the evaluation of the effectiveness of learning material after learning process

Description	Number
Number of students	39
Total Post-Test score	50
Totaled Post-Test score of learners	1,610
The effectiveness of learning material after learning process(E_2)	**82.56**

3.2 Result of the evaluation of the learning achievement

The analysis of pre-test and post-test scores exhibits that the achievement after the process (Epost) was at 82.56 and the one before the process (Epre) was at 14.62. Therefore the achievement of learning (Epost- Epre) was at 67.94 which was higher than the criteria. See details in Table 4.

Table 4 shows the learning effectiveness of student (before and after process)

Process	Total score ΣX_i	Efficiency	Effectiveness ($E_{post} - E_{pre}$)
Exercise before learning (E_{pre})	285	14.62	67.94
Exercise after learning (E_{post})	1,610	82.56	

3.3 Result of the evaluation of multimedia quality.

The result shows that the quality of multimedia of the Computer Instruction Package was rather at a high level (4.30). See details in figure 2.
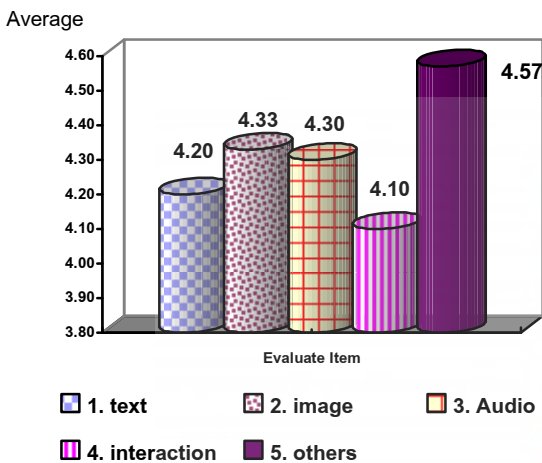
could be promoted for self-study learning.

It is recommended for learners to use the Computer Assisted Instruction Package for it was developed systematically. The development processes include analyzing, designing, developing, and quality assurance of learning tools as well as the efficient arrangement of learning content which agrees to learning process, i.e. introduction to unit content, step by step introduction to each content, exercise, and clear examples of each unit. Also, other compositions of the content such as multimedia, text, image, animation and audio can excel the quality and the efficiency of the Computer Assisted Instruction Package. See details in figure 4.

Average

	1. text		2. image		3. Audio
	4. interaction		5. others		

Figure 2 shows the result of The evaluation of multimedia quality in each aspect.

3.4 Result of the evaluation of learner satisfaction.

The Mean value of satisfaction of the sampling groups was rather at a high level (4.28). See details in figure 3.

Average

1. General composition
2. text
3. images, animations, simulations, video sequences
4. audio and narration
5. content
6. interaction
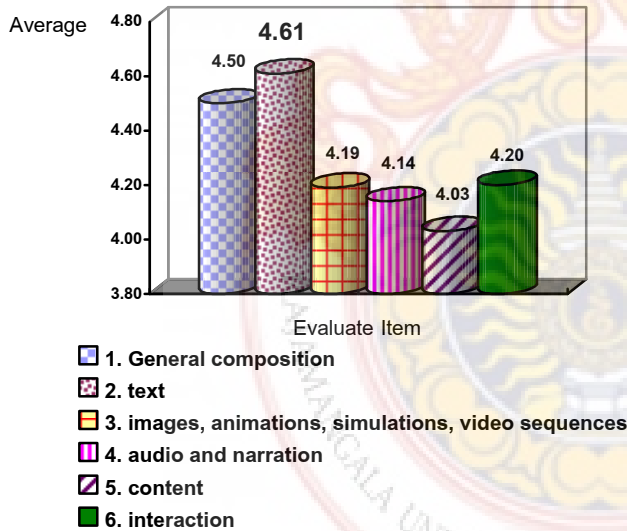
Figure 3 shows the result of the satisfaction of learner towards each aspect.

It can be concluded that the Computer Assisted Instruction Package with tutorial through e-learning on computer technology curriculum has the efficiency that
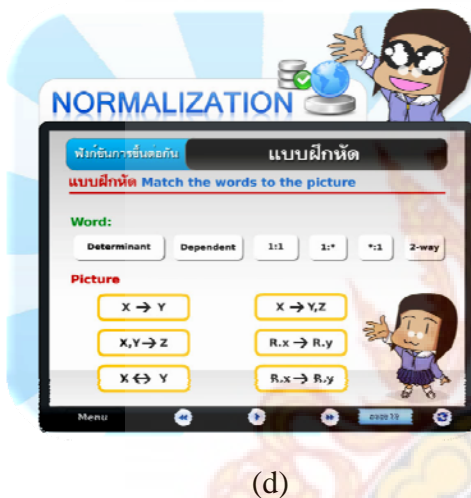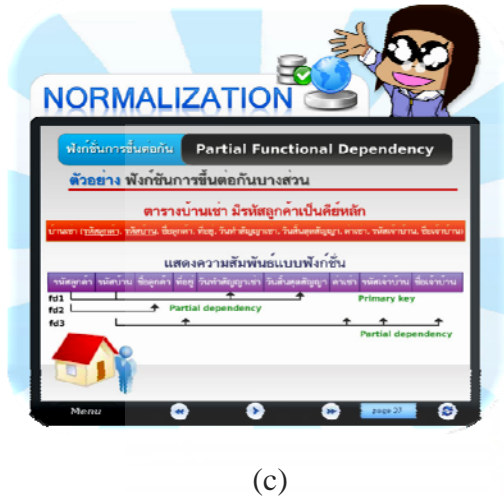

(a)

(b)

(c)

(d)

Figure 4 shows image's screen of the Computer Instruction Package (a) Introduction b) content c) Example d) Exercise

4. Conclusions

The research result reveals that the efficiency of the Computer Instruction Package was at 82.50/82.56, corresponding with the 80/80 criteria. The analysis of pre-test and post-test scores shows that the effectiveness after the learning process (Epost) was at 82.56, which was higher than before the process (Epre), 14.62. Therefore the Computer Instruction Package on Program Design and Development helps increase the students learning effectiveness

up to 67.94, corresponding with the 60 criteria. The Mean value of satisfaction of the sampling groups was rather at a high level (4.28). It can be concluded that the Computer Assisted Instruction Package with tutorial through e-learning on computer technology curriculum has the efficiency that could be promoted for self-study learning.

5. Acknowledgements

6. References

[1] Wangpipatwong, Thanakorn, 2007, *The development of constructivist e-learning model using the instructional design*, Doctor of Philosophy Thesis. King Mongkut's University of Technology Thonburi.

[2] Pruengkarn, Ratchakoon and Praneetpolgrang, Prasong, *The Quality Assessment Model for e-Learning Websites in Thailand*, In proceeding Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology (ECTI-CON), Ubon Ratchathani, Thailand, ECTI-CON 2006.

[3] Srikalsin, Thanupong. 2001. *The Production of Tutoring Computer Assisted Learning Material on Internet issued*, 'Basic processing and components of a computer, Master's Thesis, Faculty of Industrial Education, King Mongkut's University of Technolog Thonburi, Page b.

[4] Teeranatanakul, P., et al. 2000. *Techniques in Producing Computer Assisted Learning Material*. Bangkok Media Promotion Center.

[5] Teeranathanagul, P. and
Kiattikomol, P. 1998. "*Creating
IMMCAI Package*". The Journal of
Industrial Education. King
Mongkut's University of Technolog
Thonburi. Volume 1.   May-Nov.
Page 14-18.