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The Development and Evaluation of a Computer Instruction Package Using Multimedia for Teaching about Musical Instruments in Elementary School in Thailand

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ABSTRACT

In this paper, the authors present a study aimed at developing and evaluating a self-learning Computer Instruction Package (CIP) with multimedia. The evaluation focused on the quality of the multimedia, learning effectiveness as well as on students' satisfaction. The CIP was designed for the teaching of musical instruments to students in grades 4 and 5 in Thailand. The sample group consisted of 40 students randomly selected from grades 4 and 5 at a public school in Bangkok, Thailand. The CIP development process included five main steps: content analysis; instructional design; prototyping; implementation and; evaluation. The CIP's quality was evaluated by three multimedia and CIP experts. Results revealed that the quality of CIP was at a good level. Pre and post testing revealed that the CIP could help improve the students' learning effectiveness up to 66.67%. The CIP evaluation conducted with students revealed a high level of satisfaction. The style of narration presented along with images of the musical instruments encouraged students' interactivity with the package.

Keywords: Computer Instruction Package/ Musical Instruments/ E-Learning / Multimedia / Learning Effectiveness / Students' Satisfaction

INTRODUCTION

A Computer Instruction Package (CIP) is a form of Computer-Assisted Instruction (CAI) that relies on and emphasizes self-learning. The package was developed by using multimedia technology to increase learning effectiveness. A CIP encourages students to participate through self learning so students can study according to their own learning capability and at their own pace. Moreover, a CIP gives an opportunity for students to interact with and get feedback from lessons. Our assumption was that a CIP would be more attractive to students for this reason and would promote effective learning. One of the important things which enable students to understand concepts on a CIP is use of multimedia that can stimulate students' attention because it can allow students to have fun during learning. One of the important research aspects of CIP was the development of a multimedia CIP using the simile story model on a basic computer network (Kiattikomol, Thongkam, Boontharig, and Chinpakdee, 2007). The evaluation of this CIP showed that (1) the quality of the CIP was at a good level, (2) the CIP could help students improve their effectiveness by up to 61.42%, and (3) students' satisfaction was at the

very much level. The result of this evaluation revealed that the CIP developed by using simile story and multimedia could help students to imagine, understand, and remember the content easily.

Music is one of the major subjects in grades 4 and 5 in elementary schools in Thailand. However, one of the major problems in teaching this subject is that some schools lack musical instruments. As a result, some students lack the opportunity to practice and learn on local musical instruments. Furthermore, teaching music involves considerable content. Often, teachers cannot cover all the content in the classroom. It is for these reasons that we undertook our study. There have been other studies of the use of the computer to teach music. Some have focused on theory such as Multimedia Music Theory Teaching Project done at Indiana University (1996). Others have focused on university students such as Collins's paper on "Sound for Picture: Teaching Music in Art School" (2003). However, our study is unique in that it takes place in Thailand, relies on the use of multimedia and focuses on elementary students. Also, our CIP focused specifically on musical instruments.

RESEARCH METHODOLOGY

Population and sample:

The 40 participating students were randomly selected from grades 4 and 5 at a public school in Bangkok, Thailand. They had never studied the content which was presented on the CIP. Approximately 20 students were in grade 4 and 20 in grade 5.

The CIP development process:

The CIP development process developed by Tiranathanagul, Kiattikomol, and Yampinij (1999) consisted of five main steps as follows

- 1) content analysis
- 2) instructional design
- 3) prototyping on paper
- 4) CIP implementation
- 5) CIP evaluation.

1. Content analysis

This step involved three steps as follows:

- 1.1 Content brainstorming: This step which lasted for approximately two weeks included identifying the topics that related to the content of the music course. We relied on three experts (teachers from the school) for this purpose.
- 1.2 Concept drafting: Similar topics identified in the first step were grouped.
- 1.3 Content network analysis: All topics were ordered into a content network chart based on their priority in the study. The arrangement of topics followed either sequential or parallel order.

2. Instructional Design

This step involved two main steps as follows:

- 2.1 Strategic presentation plan with behavioral objectives and course flowchart drafting: This step included two sub-steps:
 - a) Knowledge Structure Design: The researchers divided the topics in the content network chart into four modules. Next, all four modules were arranged into the course flow chart. In each module, the researchers assigned the behavioral objectives that covered all topics in the module.

The behavioral objectives guided the researchers in the choice and design of the content presentation.

b) Learning Management System (LMS): A LMS was created to manage students' learning and to track their progress. Students could choose to register if they wanted to keep their learning records. Students could also study without registering if they did not want to keep their learning records.

- 2.2 Module presentation chart drafting: The researchers created a module content chart to give an idea of how the content would be presented in each module. Next, they designed an instructional techniques and media (text, VDO, image, animation, and audio) to present each topic. In this CIP, the researchers used multimedia. The sound was presented simultaneously with the image of the musical instrument. The intention was to stimulate students' continuous interaction with the package in order to allow them to more easily imagine, understand, and remember concepts. Each module consisted of 5 main parts including: (I) an introduction to the lesson, (II) major and additional content presentation, (III) reinforcement activity, (IV) summary, and (V) test.

3. Prototyping on paper

This step involved four smaller sub-steps as follows:

- 3.1 Script development (interactive subject frames): Paper-based scripts were developed.
- 3.2 Story development by using a storyboard technique: All paper-based scripts were organized into a sequence or parallel.
- 3.3 Content correctness, content validity and reliability check: All paper-based scripts were checked for content correctness by the content experts. Ten, grade 4 to 5 students checked the scripts for content validity and reliability. They were not part of the study's sample. They checked the scripts to ensure that they were meaningful and made sense to them.
- 3.4 Pre- and post- test item development: Test items were developed and evaluated for quality including difficulties, discrimination, validity, and reliability.

4. CIP Implementation

This step consisted of three smaller sub-steps as follows:

- 4.1 Authoring software selection: The researchers selected the authoring software, graphic software, and sound-editing software that could implement all paper-based scripts on a computer system as a courseware package.
- 4.2 Preparing acquisition of ready made or tailor-made media: Before developing a CIP on a computer system, the researchers had to create all the media such as text, video, animation, image, and audio that would be included in the CIP.
- 4.3 Completion of CIP development: The researchers developed the CIP in the form of CD-ROM by using the authoring software and media.
- 4.4 A questionnaire development: A questionnaire was developed to measure students' satisfaction. The questionnaire consisted of nine main items on a five-point Likert scale.

5. CIP Evaluation

- 5.1 Quality evaluation: The multimedia quality of the CIP was evaluated by three experts with experience in instructional design and multimedia. The experts evaluated the CIP multimedia quality by filling in a quality form after they used the CIP. Items related to sound quality, animation and interactivity etc.

- 5.2 Small group rehearsal testing: Ten students not in the sample but from grades 4-5 were randomly selected to test the CIP evaluation process. The rehearsal step was designed to give the researchers an opportunity to ensure that the evaluation process was well prepared.
- 5.3 Evaluation of the CIP: This step involved a number of sub-steps as follows:
- All 40 students completed a pre-test designed to assess their prior knowledge of the contents of the package.
 - All students used the CIP independently each day for four days for approximately one hour.
 - After students completed all four modules, they then did the post-test.
 - They then completed a questionnaire designed to rate their satisfaction with the CIP.
 - Pre- and post- test results using descriptive statistics were analysed to evaluate students' learning effectiveness ($E_{\text{post}} - E_{\text{pre}}$).
 - The questionnaire was analysed to identify students' satisfaction with the CIP.
- 5.4 Preparation of user's manual for publication: The user manual was developed for the CIP and prepared for publication.

RESULTS

Description of the CIP

The CIP for teaching music instruments consisted of four modules including

- Thai musical instruments
- Local musical instruments
- Western-style musical instruments
- Musical instruments maintenance.

Each module consisted of five main parts including

- an introduction to the lesson
- major and additional content presentation
- reinforcement activities
- summary and
- test

In addition, the CIP included an LMS that supported registration, learning monitoring, and test management in order to evaluate students' achievement.

The figures below illustrate some of the content of the CIP.

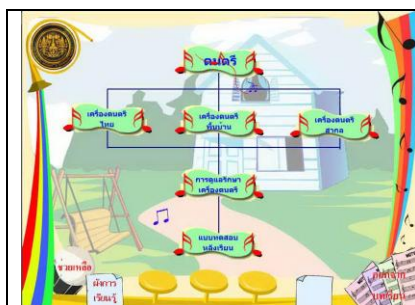


Figure 1: Main menu screen



Figure 2: Submenu screen



Figure 3: Content presentation screen



Figure 4: Content presentation screen



Figure 5: Content presentation screen



Figure 6: Content presentation screen



Figure 7: Reinforcement activity screen



Figure 8: Reinforcement activity screen



Figure 9: Summary screen

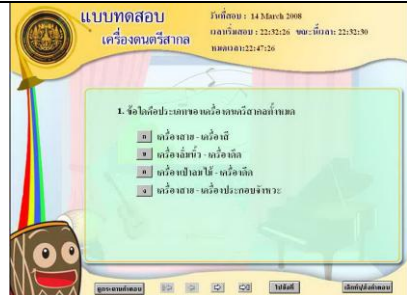


Figure 10: Test screen

Result of CIP quality evaluation

The results of the CIP quality evaluation showed that experts evaluated the CIP quality at a good level (4.41/5). When the researchers considered each quality item, they found that there were three quality items at a very good level and six quality items at a good level as shown in Table 1.

Table 1: Mean of experts' evaluations and level of quality.

Quality Item	Mean	Level of Quality
1. Introduction	4.83	Very Good
2. Reinforcement	4.67	Very Good
3. Animation	4.53	Very Good
4. Audio	4.43	Good

5. Video	4.39	Good
6. Interactivity	4.33	Good
7. Text	4.22	Good
8. Image	4.17	Good
9. Screen composition	4.13	Good
Average Of Mean	4.41	Good

Result of students' learning effectiveness

The result showed that the efficiency of students before the learning process (E_{pre}) was 17.86 and after the learning process (E_{post}) was 84.53. The difference of the two values showed that the students' learning effectiveness was 66.67. This indicated that the CIP could enable the sample group to increase their learning effectiveness.

Table 2: Efficiency of pretest and posttest and the learning effectiveness.

Item	Efficiency	Learning effectiveness
Pretest (E_{pre})	17.86	66.67
Posttest (E_{post})	84.53	

Result of students' satisfaction

The result showed that students were satisfied with the presentation in the CIP at a high level (4.31/5).

Table 3: Mean of students' satisfaction and level of satisfaction.

Satisfaction Items	Mean	Level of Satisfaction
1. Multimedia in the introduction enabled students' interest in the CIP.	4.48	High
2. Narration was clear and attracted students' attention.	4.35	High
3. Video presentation showed clearly the steps of playing the musical instruments.	4.35	High
4. The multimedia summary helped students to understand and memorize the concepts.	4.35	High
5. The matching activity reinforced learning adequately.	4.30	High
6. In the test, students could choose to not answer questions by sequence to allow freedom and flexibility.	4.27	High
7. The combination of image, text and narration explained the concepts more clearly.	4.25	High
8. Music stimulated students' motivation.	4.23	High
9. The menu and submenu helped students to understand the learning priority and topic relationship.	4.20	High
Average Of Mean	4.31	High

DISCUSSION, CONCLUSION, AND IMPLICATION

The purpose of the study presented in this paper was to develop and evaluate a self-learning Computer Instruction Package (CIP) with multimedia. The evaluation focused on the quality of the multimedia, learning effectiveness as well as on students' satisfaction. The CIP was designed for the teaching of musical instruments to students in grades 4 and 5 in Thailand. The sample group consisted of 40 students randomly selected from grades 4 and 5 at a public school in Bangkok, Thailand. Results revealed that the quality of CIP was at a good level. Pre and post testing revealed that the CIP could help improve the students' learning effectiveness by up to 66.67%. The CIP evaluation conducted with students revealed a high level of satisfaction. The results revealed that multimedia could help students to imagine, understand, and remember the concepts easily because it could engage students as well as explain and demonstrate steps in playing musical instruments in the way that was easy for students to understand. Moreover, as a form of e-learning, the CIP could serve many students at one

time. This result of this research was relevant to the previous research (Kiattikomol, Thongkam, Boontharig, and Chinpakdee, 2007).

The quality of the CIP is a result of the following:

The CIP development process was well organized in five main steps and each step had been checked and controlled by the experts. This process showed that the development had a quality control in itself. The instructional process consisted of five main parts including; introduction to the lesson; major and additional content presentation; reinforcement activity; summary and; test. These parts completed the learning process. The CIP was designed in a user-friendly manner and enabled students to control the learning process by themselves. This could make students feel free to learn. The content presentation was in multimedia format. Use of multimedia could explain difficult concepts in a way that students could easily understand and memorize content. Moreover, multimedia could make the CIP more attractive and encourage students to persist with the package. The reinforcement activities of the CIP enabled students to interact with the CIP and get feedback about supplementary content. In the test, students were not required to answer questions sequentially and could change answers before confirming all answers in the electronic answer sheet. This approach was designed to put students at ease and to decrease test pressure.

In terms of the limitations of our study, we only tried our package with students in grades four and five. We do not know how effective it might be for other grades. However, testing the package in other grades may constitute a next step for our research. As well, we only tested the package in one school. Trials on a larger scale might yield different results. The content was closely tied to the Thai curriculum. However, the principles of our approach and the general design of the CIP serve as a prototype that could be replicated in other curriculum contexts in other countries. In terms of our method, we did not use a control group that was instructed in a similar content. That approach would have been beyond the scope and purpose of our study but it is an approach that others may wish to investigate. Our CIP was designed to be used as a self-learning package and therefore did not involve any collaborative activities. Other CIPs might be developed that could serve this function.

In terms of implications, we believe that our CIP could be used widely in schools in this country. Its implementation and ease of use would require little or no training of teachers. However, others wishing to create modules such as ours should recognize the extensive costs in terms of human resources that the development of such a CIP involves. If the CIP were to be used on a large scale with a large number of students, then the costs involved would be justified.

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