

行政院國家科學委員會專題研究計畫成果報告

電腦應用軟體教學模式之發展(二)

計畫類別：個別型計畫 整合型計畫

計畫編號：NSC 88-2520-S-032-002

執行期間：87年8月1日~88年7月31日

個別型計畫：計畫主持人：李世忠

共同主持人：

整合型計畫：總計畫主持人：

子計畫主持人：

註：整合型計畫報告與子計畫成果報告請分開編印各成一冊，
彙整一起繳送國科會

處理方式：可立即對外提供參考
(請打✓) 一年後可對外提供參考
 兩年後可對外提供參考
 (必要時，本會得展延發表時限)

執行單位：淡江大學教育科技系所

中華民國八十八年十月

電腦應用軟體教學模式之發展(二)
Development of a teaching model of group instruction
for computer application software

計畫編號：NSC 88-2520-S-032-002

主持人：李世忠

執行機關：淡江大學教育科技系

關鍵詞：資訊教育、電腦輔助教學、教學設計

Keywords: Computer education, computer-assisted education, instructional design.

中文摘要

本研究計畫主要目的為依學理及測試結果，發展一個群體應用軟體的教學模式及輔助教材(光碟)。教學模式是將教學過程中重要的因素和流程有系統地安排，以協助教授電腦應用軟體之教學者有一教學模式可依循。研究過程主要包含評鑑教學光碟、發展教學光碟與群體教學模式及評鑑群體教學模式。研究方法採用放聲思考、使用者效能測試及訪談。研究樣本為淡江大學教授「資訊概論」課程之教師與修習該課程之學生。四十八位學生與五位教師分別參與三階段的教學模式與光碟的評鑑與發展。研究結果顯示學生與教師均認為教學模式與光碟有助於群體教學，且光碟能協助學生日後之個別學習。多數學生反應群體教學時練習的時間仍不足，在光碟協助下，教學二週後學生應可進入個別獨立學習階段。

Abstract

This study was designed to develop a practical and effective teaching model and instructional CD-ROM. The assumption was that a systematic model of computer instruction that was highly organized, provided hands-on learning, and proceeded in small steps would be successful in increasing the skill level of students. It utilized the cognitive concept of "scaffolding" that novice should be assisted at the beginning and promoted to self-learning. First of all, students and instructors evaluated four instructional CD-ROMs and designing principles for instructional CD-ROM was developed to match the curriculum.

Secondly, Interviews were employed to gather data from the instructors and students of introductory computer courses. Based on the criteria defined by literature review and interview, a teaching model and instructional CD-ROM were developed for teaching computer application software. These products were further refined and tested by selected instructors. Formative evaluation of the model and CD-ROM were conducted with participant observation and interview. Results indicated that instructors and students held a positive attitude toward the instructional model and CD-ROM. However, students suggested they need more time for practice during group instruction. They concluded that the CD-ROM could take the major role of individualized instruction after four to six hours of group instruction.

Introduction

Today, many people are learning computer application software. As tool, the computer is used by teachers and students to aid learning and facilitate academic work, such as with word processors, presentation, or databases management. Students must become computer-literate to take advantage of the regarding the best ways to use computers (Simonson & Thompson, 1997). Millions of courses have been taught about the applications of the computer over the world.

Tamkang University has the most heavy student population in Taiwan. Each year approximately 4,000 students took Introduction to Computer courses. These courses were taught in large classes with average 120 students per class. Students were required to learn several computer application software such as Microsoft Word, PowerPoint or Excel. In a large class environment, while efficiency was desired, many wondered if the time spent for instruction was worth while. A survey of course evaluation revealed many pedagogical problems. According to the data, major problems with instructions were lack of practice and examples, contents overload and disordered learning sequence.

The purpose of this study was to develop a practical and effective teaching model of group instruction for computer application software. The expectation and assumption were that a systematic teaching model for computer application software that was highly organized, provided hands-on learning, and proceeded in small steps would be successful in increasing the skill level of students.

A teaching aid was developed in accordance with the group teaching model to assist students to learn from group instruction to individual learning. It utilized the cognitive concept of "scaffolding" that novice should be assisted at the beginning and promoted to self-learning (McNamara & Pedigo, 1995). This learning CD-ROM served as a mediator from group instruction to individualized learning. Designing a CD-ROM that had exactly the same contents and teaching sequence as the group instruction would assist students referring to the CD-ROM during practice phase. The CD-ROM could show them the exact content the instructor just presented and served as an assistant during group instruction.

Methodology

This study took place in two different stages. The first was the evaluation of four selected instructional CD-ROMs. The second stage involved the development and evaluation of the instructional CD-ROM and group teaching model. This study used qualitative data collection methods. An array of methods was used to collect information related to this evaluation which included observation, think aloud and interview.

Selection and evaluation of the learning CD-ROM

While there were many different types of so-called instructional software, the study was concentrating on the instructional function of the CD-ROM. Microsoft Word and PowerPoint were the application programs taught in most "Introduction to computer" courses. According to the data of learner analysis, most students may have prior experiences with Microsoft Word; therefore, Microsoft PowerPoint learning CD-ROM was selected for evaluation. Four instructional CD-ROMs were selected to be included in this evaluation. The following selection criteria were used to define and select instructional CD-ROM.

- The programs should have complete instructional contents to learn the application software.
- The program should have clear instructional objectives.
- There should be a variety of types of information that users can access, such as still graphics, text, audio, and animation.
- The program should have motion video clips with audio narration.

Evaluation of the instructional CD-ROMs

Subjects used in this study were undergraduate students who were familiar with Microsoft Windows environment and did not use Microsoft PowerPoint before. Twenty-four students were divided into four groups for each CD-ROM evaluation. The evaluation took place in four days and each day six students were asked to learn Microsoft PowerPoint with the CD-ROM provided. They first spent forty minutes going through a specific section and then engaged in practice.

The research design required the students to talk aloud as they went through the programs, explaining what motivated and facilitated their learnings. Think aloud protocol is a specific kind of verbal protocol in which the user says out loud what she is thinking while she is carrying out a task or doing some problem solving (Preece, et al, 1994). Subject worked their way through the instructional CD-ROM while thinking aloud. Six observers oversaw and recorded the process and they interviewed the subjects immediately after the learning. Interview questions focused on the ease of use, instructional methods, media formats, clearness of explanation and demonstration, appropriateness of examples, and other usability problems during their learning.

After the programs were analyzed, five experts were contacted for interviews. The experts interviewed in this study were instructors of "Introduction to Computer" courses. Most of them were professors from the department of Information engineering. Based on years of experience in teaching computer application software, five instructors were selected to review the selected CD-ROMs. They evaluated six CD-ROMs with the evaluation guide provided.

Development and evaluation of instructional CD-ROM and teaching model

The information obtained from the students and instructors were analyzed and synthesized to generate a list of designing principles for instructional CD-ROM. According to these principles, an instructional CD-ROM was developed in eight weeks. Eight weeks after the evaluation, these experts formed a focus group. Focus group discussions were valuable to ascertain the universality of comments. A prototype teaching MODEL was put together as following:

- Motivation stage
- Organization stage
- Demonstration stage
- Exercise stage
- Link up stages

Usability test procedure was implemented for this stage of evaluation. The phrase usability testing has been coined to represent the process of involving users to evaluate a system to ensure that it meets usability criteria (Corry, Frick, & Hansen, 1997). Usability testing was effective because real users perform real tasks under the eye of experienced observers. The purpose of the testing was to determine how efficiently and effectively that instructors could use the CD-ROM in accordance with their teaching.

Participant observation and interview were used to collect information from the students and instructors. Instructors were trained to teach PowerPoint according to the group teaching model. In previous years the instructors had taught the same unit without following the teaching model. Thus, the instructors were able to compare the effects of using teaching model and CD-ROM. The researcher interviewed them briefly several times during the study and extensively at the conclusion of the study.

Weinschenk, Jamar and Yeo (1997) stated that "all you need to test is ten people if they are representative of your real users, testing ten people who are truly representative will capture 95% of the problem". (Weinschenk, Jamar & Yeo, 1997). Therefore, six observers attended four classes in four weeks. They spent time observing the teaching process, patterns of difficulties and successes with the CD-ROM. After the instruction, they interviewed the students and instructors. Six students were selected randomly from the class. Interview and observation guide was used to interview. The general interview guide for this study involved outlining a set of issues that were to be explored with each respondent before the interview took place. Students were also encouraged to address issues not represented in the interview guide. For the interview portion of this study, the questions appear below.

1. How did the CD-ROM assist or hinder your learning?
2. What were the important teaching strategies and methods in the instruction?
3. How did the group-teaching model used contribute to the teaching of the software?
4. At any stage of the instruction, was any process misleading?

Results of teaching model for group instruction

1. Motivation level

- Uses an example to explain the overall function of the application software. For example, demonstrate what is "presentation" software and what it can do.
- Presents a brief finished product for overview.
- Describes relationship of current content with the overall goals.
- Explains the interface of the CD-ROM provided.

2. Organization and control

- States instructional objective before or after the short and fast prelude example and advises students how to learn.
- Provides advance organizer such as contents chart, flowchart or outlines for this unit of instruction.
- During instruction phase, instructor should take the control of the computer broadcast system to cut off other distraction. Instructor should have the control of the information displayed on each student's screen.

3. Demonstration

- During the instruction, explains and clarifies first new terminology and jargon.
- Demonstrates the operation of each function within 10-15 minutes.
- Demonstrates the section with example, use example to introduce different software function. Always uses example throughout your instruction.
- Explains the process before mouse movement, do not perform any task (pull down menu) before verbal explanation. Unless necessary, do not move pointer during instruction to avoid distraction.

4. Exercise

- Provides time for exercise after each section of instruction.
- During exercise phase, checks each student's process.
- Asks students to refer to the CD-ROM provided.
- Arranges the "expert" students to assist slow learners.

5. Link up with other unit and feedback

- Presents student's work on large or individual students' screen and gives encouragement.
- Explains confusion or misconception you observed during exercise.
- At the end of each unit, summarizes the lesson and goes through the function of pull-down menu as conclusion.
- Provides homework to integrate the model learned. Provides comprehensive exercise for each section to integrate the sub-skill previously learned.

Results of designing principles for instructional CD-ROM

1. Introduction phase

- Provides instructional tour, either text, graphic, or animation for using the CD-ROM.
- Advises user the learning sequences and provides default lesson at the beginning.
- Uses menu item number to inform user the suggested learning sequence and overall structure.

2. Instruction phase

- In the beginning, provides a short and fast prelude example, let the user foresee the final product may look like.
- In the beginning, explains the function with different examples to assist user constructing an overall conception of the application program.
- Informs user how many segments are included in the session.
- Gives more content control after user had learned the basics session.
- Limits instructional time of each video clip within 10-15 minutes.
- If pull down menu were clicked, use visual arrow to highlight the item selected
- When teaching new topic, provides brief overview and lets user see the finished product first.
- Organizes and marks off video clip to provide button to choose other clip.

3. Interface design

- Uses text, arrow and graphics to show the learner which section they are in.
- Provides "pauses", "forward", "back" and "stop" button for video clips.
- Uses different color bar for the window of motion video clip to differentiate the window they were working on.
- When playing a clip, changes the appearance of the mouse pointer, users may be confused with the mouse point they are using.
- Provides visual timeline to inform user the length of video clip.
- Guide or cartoon figure could be used at the beginning of each section to provide overall opening remarks.
- If "guide" were introduced, uses cartoon figure instead of real person.

4. Media format

- Uses continuous video clip instead of static picture.
- If audio narration were applied, text would be supplementary.
- If text were shown on the screen, be brief and concise. Overuse of text may interfere with audio narration.
- The tone of narration should be motivating, when explaining the examples, question or joke will sustain user's motivation.
- Male or female voice makes no difference.
- Background music is more suitable for individual learning than group instruction. Music with fast or strong melody may be irritating.
- When explaining, speaks with the manner and tone as users' friend.

5. Examples

- Provides example that is related to users life or subject matter.
- Uses the same example to introduce the basic concept and function.
- After students have basic concepts of the application program, uses different kinds of examples to sustain continuing motivation.
- Do not overuse the same example.
- Provides links to application software.
- Summarizes main point before the section closed.

Results from interview with students and instructors

Instructors and students held a positive attitude toward the teaching model and CD-ROM. However, students suggested they needed more time for practice. Students felt the learning modules should be divided into shorter segments. Most users reported the modules should be broken down into segments can be studied in 10-15 minutes. Having the modules divided into short segments would make it easier for the users to practice immediately after the instruction.

Most instructors agreed that the instructional model and CD-ROM helped them organized their instruction. With the help of the CD-ROM, they had more time to assist other individual student. Students also perceived these learning CD-ROMs a helpful learning tool. Most students considered the learning CD-ROM an applicable learning aid for group instruction and self-learning. They actually used this CD-ROM after class and found it a useful learning tool. Few students consented that they might refer to the CD-ROM rather than instructor.

Most instructor and students concluded that the CD-ROM could take the major role of instruction after four to six hours of group instruction with teacher. They suggested that after students have an overall conception of the application software, most students were able to follow CD-ROM's instruction module and learned by themselves. However, they needed the instructor to "scaffold" them through the program for the first few hours.

Conclusion

Several conclusions could be drawn from this evaluation. First, both the students and instructors felt that the instructional model and CD-ROM were well developed. The teaching model gave the instructors a guideline to organize and

present their instruction. Second, learning CD-ROM assisted students the technology to support instruction was becoming more widely available in schools. This study indicated that the time instructors and students invested in developing the teaching model and CD-ROM not only gave them a powerful tool of group instruction but might also give them new insights into combining technology with their instruction.

References

- Corry, M., Frick, T. & Hansen, L. (1997). User-centered design and usability testing of a web site: an illustrative case study. *ETR&D*, (45) 4, 65-76.
- Could, J. D. (1988). How to design usable systems (excerpt). In R. Baecker & W. Buxton (Eds.), *Readings in Human-computer interaction: A multidisciplinary approach*, (pp. 93-115). New York, NY: Morgan-Kaufman.
- Mayhew, D. J. (1992). *Principles and guidelines in software user interface design*. New Jersey: Prentice Hall.
- McNamara, S. and Pedigo, M. (1995). Development of an individualized computer training model for classroom teachers. *Journal of Technology and Teacher Education*, 2(4), 241-50.
- Preece, J., Rogers, Y., Sharp, H., Benyon, D., Hollard, S., & Carey, T. (1994). *Human-computer interaction*. Workingham, England: Addison-Wesley Publishing Company.
- Simonson, M. & Thompson, A. (1997). *Educational computing foundations*. Columbus, Ohio: Prentice Hall.
- Weinschenk, S., Jamar, P. & Yeo, S. (1997). *GUI Essentials*. New York: John Wiley & Sons, Inc.