PRACTICAL CONSIDERATIONS FOR MULTIMEDIA COURSEWARE DEVELOPMENT: AN EFL IVD EXPERIENCE

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ABSTRACT

Well grounded theoretical motivation for technological innovations should always lead CALL courseware development. Second language acquisition theories and practices, instructional design concepts, human factors research, and advances in educational technology can be relevant. However, the how-to aspects of courseware development, especially for the most popular star- multimedia, become immediate considerations and concerns once one chooses the platform on which to proceed. This paper addresses these practical aspects through the exploration of the development of a piece of English as a foreign language (EFL) interactive videodisc (IVD) courseware. The objective setting, instructional design, and on-line implementation are explained in detail. Subprocesses include data collection and analyses, content analysis, and screen design. About 95% of the courseware has been implemented and is ready for pilot testing. It consists of four units: an Introduction, Hyperscript, Film Viewing, and Film Viewing with Instruction. Hyperscript is a design using a hypertext format, while Film Viewing is designed with various kinds of on-line help. Film Viewing with Instruction is a module with a great deal of program control. Lastly, linkage to the language classroom, evaluation approaches, implications, and recommendations for future courseware development are discussed.

KEY WORDS

Computer assisted language learning (CALL), interactive videodisc (IVD), second language acquisition (SLA), English as a foreign language (EFL), multimedia courseware development, instructional design, formative assessment, courseware evaluation, hypertext.
INTRODUCTION

In the spring of 1991, the Department of Foreign Languages at National Tsing Hua University was awarded a grant by the Ministry of Education to acquire equipment for teaching enhancement. Among the plans, the acquisition of two sets of instructional equipment was to be completed by then. An IVD project of courseware development was launched to enhance EFL teaching in the department. Due to the shortage of the number of instructors, the quantity and quality of language skills courses could not meet the students' needs in our institute. Thus, the IVD project aimed at assisting the training in EFL skills.

In our project, a review of the literature on theoretical aspects was carried out first, and the implications have been synthesized for work in the courseware design phase (see details in Liou 1992). In this paper, the important practical considerations through the experience of developing the EFL courseware are addressed. The paper is organized by first describing how the project was completed in discussing design considerations, objective setting, instructional design, implementation; then the paper discusses how such courseware can be linked to language classrooms, and how courseware evaluation should be planned. It concludes with a discussion of the implications and useful recommendations for those who are willing to undergo such an enterprise.

THE PROJECT

Design Considerations for the Project

The minimal requirements for a multimedia courseware development project involves: the media, the institutional needs/constraints, and design principles.

Know the media. The major and first merit of an IVD system lies in the capabilities of presenting complicated types of visual information as well as presenting rich and authentic target language (TL) input for practice which are far more enchanting and authentic than computerized graphic displays. Supporting the application of general video to language teaching, Allen (1985) maintains that video has the following strengths:
• it presents realistic 'slices of life,'
• it gets students talking,
• it provides visual support, and
• it offers variety and entertainment.

IVD also provides rich TL input. Allen (1985) enumerates the following linguistic and paralinguistic features:
• verbal speech,
• nonverbal vocal items such as accent, intonation, or stress, and
• nonverbal visual items such as gestures, facial expression, eye contact, posture, proximity, appearance, or setting. Given good design, IVD may bring learners to spend more time on task because of the variety of learner options and high level satisfaction (Knisbacher 1991).

Know the institutional needs/constraints. Though the curriculum guide set by the Ministry of Education in our country specifies content subjects such as the Study of English Literature and American Literature as required courses, our learners are not prepared to pursue those courses when they are first admitted to the college. This is mainly because the six year obligatory high school English education has not prepared them for the necessary language proficiency. Thus, a certain proportion of language skills such as writing and oral practice becomes a crucial part of the college curriculum. These language courses tend to aim at teaching the 'language' rather than at 'communicating.' Further, these courses follow an ordered sequence of materials, which results in the fact that the "natural" target language is rarely used in class. In addition, a long standing emphasis on production skills creates a situation unlike that of an informed environment where students may be asked to utter linguistic forms that have not yet become internalized. Furthermore, the problem of large class size has troubled language instructors. In a writing class, say, 26 students' essays require many hours of grading, let alone the time invested on material/class preparation. The problem is compounded by the fact that the vast majority of EFL teachers share a native language with our students, so that it is very often that English use is reserved when the pace and direction of the class is not interfered with.
The constraints pose a need for strengthening language skills for learners. More language courses should be offered; meanwhile, more native speakers' input should be provided for learners to acquire the language. The material presented in our IVD project is chosen in an attempt to provide authentic learning input for learners.

Know the design principles. IVD can provide an authentic and adaptive learning environment by incorporating video into a personal computer and displaying a vivid scenario, which is far more enchanting than text, graphics, or animation generated on a computer monitor. However, IVD alone is not a panacea. Solid instructional design, like good lesson plans, leads to successful courseware as well as to gains in learning. Several aspects of launching an IVD project should be underscored: the setting of objectives, materials selection, and instructional design.

As a new delivery medium, IVD should accommodate media based objectives, while taking language learning theories and pedagogy into account. The following is a list of possible instructional objectives in an IVD language learning lesson.

• Develop reading comprehension skills with the help of viewing video.

• Develop active use of the language by learning to imitate speech acts.

• Develop speaking skills in English by imitating pronunciation, stress, and intonation as well as extra linguistic components.

• Bring the learner as close as possible to a real conversational situation, and provide the learner with enough tools so that he or she can understand the conversation.

• Expose the learner to the culture of the language.

• Encourage students to become active listeners, guessers, predictors, and risk takers.
Regarding materials selection, appropriate video contents are crucial to achieve the objectives. Ideally, the interactive video system should include various speech acts as well as cultural facts - in content as well as in sound, graphics, animation, video stills, and action video. Daily life situations such as going shopping or making a phone call to apply for a job provide the basis for good video materials. However, the videodisc material is well known by IVD developers, not to be as easily accessible as videotapes regarding the production of new video or editing of existing video. To compensate for this limitation, feature films serve as good language material because the films themselves are communicating messages to the audience; thus they become slices of real communication events. The use of films, however, requires intensive analysis of their content and skillful adaptation to language learning.

For instructional design, the content of the video chosen ought to be analyzed to see to what extent it has included the TL items to be learned. Computer texts can include synonyms, definitions of words, explanations, similes, metaphors, and examples to help students comprehend unfamiliar TL items. On-line vocabulary and grammar references using a hypermedia format (integrated, nonlinear databases that link, annotate, and cross reference video, animation, still images, text, music, and voice) can be designed. Many effective teaching methods may be used as models in implementing the IVD tasks. For example, the experience model can be effective when the instructional design adopts a simulation format for students to explore in a TL culture. In order to sequence the materials, the field of CALL has its unique subject specific or even language specific grading or sequencing considerations and strategies. For example, Nunan (1988) details how difficulty as a grading consideration should be determined and applied to sequencing course units. These can be rethought and applied in an IVD project.

Setting of Objectives

Referring to guided video use (Hadzima 1991, 30), communicative language teaching (Goodman 1984, 112-113), and our own needs, the following lists our objectives incorporating three perspectives: the language (linguistic and paralinguistic aspects), the learner (strategy training), and the language learning (the negotiated interaction model, e.g., Long 1985; Doughty and Pica 1986).
The linguistic and paralinguistic features
• focus on particular features of the message (linguistic features, sociolinguistic features, discourse features, strategic features);

• exploit paralinguistic features which differ from the students' system: proxemics, gestures, facial expressions, eye contact, posture, and appearance;

• exploit instances of turn-taking and contextualized reference;

• exploit instances of conversation management, topic avoidance, topic nomination, and clarification.

The training of learning strategies
• Direct strategies are those used in mental processing of the language (based on Oxford 1990):
  • increase auditory and visual memory,
  • use events in video or movie to practice schema building,
  • use comprehension questions for students to frequently and quickly verify assumptions used in schema building.

• Indirect language strategies provide support to direct strategies (based on Oxford 1990):
  • learn to tolerate less than total understanding,
  • focus on self improvement, taking the responsibility for one's work, and pride in one's achievements.

Language learning: The negotiated interaction model
• The purpose is to provide students with an instrument for negotiation of meaning:
  • to watch, listen, and interpret the story by making guesses,
  • to develop active listening skills by using whichever clues are available to the students,
  • to seek further information by requesting confirmation of guesses, to make decisions about what further information is needed, to increase tolerance of ambiguity.
Instructional Design

The feature films, *Ghostbusters*, *The Adventures of Robin Hood*, and *2001* in a CAV (constant angular velocity) videodisc format have been chosen for the major learning materials. The reason for choosing the CAV format is that it enables viewing of the film frame by frame. In the first year of the project, *Robin Hood* and *2001* were used in the pilot test, so the implementation was on a small scale. The major part of the research work was done using *Ghostbusters* in the second year.

Data Analysis and Construction

Some initial data preparation and analysis were crucial to facilitate the instructional design process:

- English transcripts and translated Chinese scripts,
- form function analysis of speech data in the film,
- content analysis for material selection, and
- consultation and adaptation of encyclopedic information for background information.

In addition to the movie itself, all the original scripts are provided at the end of the videodisc, together with the director's comments, story-boards, pictures about how the ghosts were designed to be used in the film, and other rich resources available for any creative multimedia designers. Even though the IVD included the scripts of the movie, there were discrepancies due to impromptu performances; therefore the audio had to be transcribed. Four undergraduate assistants were in charge of the initial transcribing tasks and then translated the speeches into Chinese. An American colleague and I double-checked the transcripts and translation. The novel, *Ghostbusters*, written by the original playwright (Milne 1984), was referred to in understanding the movie and designing the courseware.

Among all the English transcripts, 100 conversational turns were chosen for a form function analysis. The analysis was based on Van Ek's (1975) scheme of content specification where form function correspondences are listed under six major language function types:
• imparting and seeking information,
• expressing and finding out intellectual attitudes,
• expressing and finding out emotional attitudes,
• expressing and finding out moral attitudes,
• getting things done (suasion), and
• socializing.

Each sentence in all the turns chosen was coded with one single category. The results yielded 230 unique form function correspondences under 67 different language functions summarized in Table 1. The results indicate that imparting and seeking factual information as is the major category to which these utterances belong. The analysis provides some basis for researchers to understand what language data learners will be exposed to in viewing the film.

<table>
<thead>
<tr>
<th>Main Categories</th>
<th>Subcategories</th>
<th>Ratio (out of 230)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. imparting and seeking information</td>
<td>128</td>
<td>55.65%</td>
</tr>
<tr>
<td>2. expressing and finding out intellectual attitudes</td>
<td>40</td>
<td>17.39%</td>
</tr>
<tr>
<td>3. expressing and finding out emotional attitudes</td>
<td>26</td>
<td>11.30%</td>
</tr>
<tr>
<td>4. expressing and finding out moral attitudes</td>
<td>6</td>
<td>2.61%</td>
</tr>
<tr>
<td>5. getting things done (persuasion)</td>
<td>18</td>
<td>7.83%</td>
</tr>
<tr>
<td>6. socializing</td>
<td>12</td>
<td>5.22%</td>
</tr>
</tbody>
</table>

Table 1. Results of form function analyses

Regarding a feature film like Ghostbusters, a set of criteria could be defined to help code or analyze the content of the film in terms of discourse. The possible considerations in selecting materials are listed in Table 2.

Feature films contain rich material for language learners. Table 3 lists some of the items we have chosen.
I. A. Linguistic Aspects (for language learning)
   1. Visual — textual
   2. Aural — audio, Conversational, song lyrics used to train listening, speaking, writing, reading, culture, or learning strategies

B. Media Aspects (learning vs. motivational)
   1. multi-media (e.g., magazines and reporters on TV)
   2. action, split-screen

II. Levels of Importance
   1. themes
   2. characters
   3. human behavior
   4. humor (linguistic vs. paralinguistic)

III. Theme, Character, Culture, Religion, Music - key classes on each side of the videodiscs

IV. Ease of Production
   1. ready made material on video (text, figures, speech, action, music)
   2. self produced material (text, VGA-graphics, digitized speech, animation, scanned image, digitized and edited still video)

   I. Culture: something students can learn or become aware of; e.g., American party, baked chicken, bow down, the building of Dana's apartment.

   II. (About) Ghost: -buster; What is it? What does it look like? How can it be trapped?

   III. Media: characteristics of the film media and multiple kinds of media; e.g., fade-in effect, split-screen viewing, trio's first case at a hotel.

   IV. Behavior: body language for communication; e.g., old man's reservation of Ghostbusters' equipment, reluctance to go upstairs together with Ghostbusters; Egon's reservation of Ghostbusters's equipment because of lack of testing.

   V. Dialogues: interactivity made between Program and Student including some exercises.

   VI. Language: Whatever implied in the script (dialogue or play script) that should be learned OR language of humor.

   VII. Character, Music (and Action)

   VIII. Religion: end of the world, the archbishop's speech, theme.

Table 2. Criteria for content selection

Table 3. Items selected based on content analysis
Courseware Design

To reach our objectives, the module we designed contains four main units and three subunits as shown in Figure 1. The textual information on the screen is accompanied by audio recorded by a native speaker. Production sheets were used to facilitate the design process. The format of the sheet was based on Meskill (1991). The sheet makes possible the sketching of screen layouts, specification of media types, and flow of information, a sample of which can be viewed in Table 4.

Table 4.
Unit I — Introduction gives the users a global picture of what the film is about. As the names suggest, they serve as short introductory presentations for the movie. Vocabulary help which gives synonyms for ghosts used in the film, difficult words with respect to supernatural powers such as "clairvoyance," "psychic," or "telepathic," and equipment for ghostbusting is provided. In addition, a section on procedures of ghostbusting with the help of pictures or video playback is designed to provide background knowledge and words with related semantic fields. Learning English through reading textual information, viewing the action in the film, and listening to and roughly comprehending English speech in the film are the objectives of Unit I.

Figure 1. Flow chart of the courseware
In Unit II, a prototype hypertext format is adopted. Hypertext, a very popular feature of CALL, provides textual information to the learners in a nonlinear way (flow). The rationale behind this design is realization of the phenomena that human beings do not process information linearly and sequentially but in a nonlinear and parallel manner. A simplified explanation for hypertext is that it is composed of nodes and links where a node defines the types of information used in the system, and a link denotes the relationships among types of information. Unit II in this project is to achieve the objectives of reading for comprehension and acquisition of vocabulary with various links of meaning. The main text in this Unit is the original script for Ghostbusters, side 1, which is recorded on the disc. In presenting the script one page or screen at a time, word/expression definitions or explanations of words and expressions in corresponding Chinese, and associated sound, motion video, or graphics with the script are linked in a relevant and context sensitive fashion in an attempt to facilitate comprehension of the text. The design involves one level of hypermedia because the text is basically viewed linearly, page by page. A sample layout is shown in Figure 2.
Whenever the reader has a question about a word or expression, s/he can (a) click on the bold words to access the Chinese meaning directly or (b) click on the "Dictionary" button in the right hand corner where s/he can type in the unknown item to be searched and obtain the Chinese definition in context. If the learner wants to skip through pages to look at what is in the Unit, s/he can click on the 'page' icon and type the desired page to read. There are 67 pages in this Unit. At the end of page 67, there is a summary page with 'Characters" and 'Background Information" icons. In "Characters," detailed information about key characters such as “Venkman,” “Stantz,” “Spengler," and “Dana” can be consulted. In “Background Information," encyclopedic information for “Gothic” (New Knowledge Library 1900,1110-1114), “New Wave,” “St. Jerome,” “Galileo,” and “Punk” is provided in an index format — with page numbers for the location in the text. In addition, dialectal information such as 'Queens Accent' is provided under this section. This serves as a review of what learners have read about the script and a resource for learners who wish to entertain their curiosity.

Unit III, “Viewing of the Film," is a resource module where the learner has full control over all the content by means of the videodisc control panel as shown in Figure 3. In addition to viewing the film at will, the learner may request on-line help about the content by clicking the "HELP" button whenever s/he does not understand the utterances.

Figure 3.
After s/he asks for help, eight levels of help are readily available: the English script (on/off), Chinese script (on/off), Gist, Background Information, Idiom Search, Word Search, Repeat (the current sentence), and Repeat the Last (sentence). The Gist summarizes the main ideas for each segment of the videodisc. The objective in this Unit is to foster independence in the user, who will be able to learn English through viewing and listening to a film with the help of various types of resources.

Unit IV, "Viewing of the Film with Instruction," simulates the situation where a teacher uses video to give instruction as s/he would in class. Various types of "intervention" during video playback are designed to give extra information or ask learners to do a variety of exercises: Explanation/Show (see Figure 4), Comprehension Check/Prediction, and Exercises-matching, scrambled scenes, dictation cloze, summary writing, etc. In this Unit, a great deal of program control is designed to provide direct instruction for language learning. In this Unit, traditional instruction and student performance checks are the main instructional strategies. The objective to be achieved is for learners to acquire English through guided viewing and presentation of target textual information or audio information.

Figure 4.
Computer Managed Instruction

The goal of developing this IVD project is two fold: enhancement of EFL instruction/learning and preparation for research in EFL learning. Thus, individually adaptive instruction and recording of individual differences should be achieved through design in the aspect of computer managed instruction. Individualized instruction can vary according to content, sequence, pace, display, internal processing, and advisement strategy in an instructional context (Chung and Reigeluth 1992). The computer managed instruction (CMI) part consists of (a) checking of hardware, video overlay card, audio card, videodisc side, video brightness, etc., and (b) recording of logon data (time, identification, password), time on each unit, total time on session, paths a learner goes through, number of times that help is requested, and on-line performance. The program records each decision in various paths while students navigate through the IVD courseware. This is to facilitate research in student learning styles or preferences in the future.

Implementation

The on-line programming was done by two graduate students and two undergraduate students who worked part time from August of 1992 to July of 1993. So far, 957o of the design has been completed using four sides of Ghostbusters, while only one side of Robin Hood and 2001, which were originally used for pilot testing, was programmed. All three of the videodiscs can be used for EFL learning though the latter two consist of much less material. The media formats, equipment, authoring package, databases, and design of the templates in the IVD courseware will be presented in detail.

Media Formats

In Philips’ CD-I Design Handbook (1992) the media formats which CD-I can accommodate are itemized. While IVD is technologically less advanced than CD-I, the current project explores all the media formats mentioned there which mainly belong to two categories: video and audio.
Video types

- natural images (directed from videodisc players through video interface cards)
- graphics (generated by computer packages such as paintbrush in Microsoft Windows or obtained by scanners’ processing)
- combination of (a) and (b): this can be achieved by either overlay of analog video images or digitized still video images
- partial screen motion or still video images: the effect is achieved through re-sizing of analog motion video or digitized video images

Audio types

- compact disc audio (CD-audio)
- digitized speech or external sound sources

Equipment

- An IBM compatible platform (model 80486 with 8MB RAM) with a color monitor equipped with a touch screen. The computer is connected to a laserdisc player, a video board, and a CD-ROM player, to be detailed in the following.
- A Pioneer laserdisc player (LDV 4400): interfaced through a live motion video controller (Bravado).
- The Truvision Bravado Board: the controller is the video graphics engine. It, with a bootable SuperVGA chip (VGA resolution 1024 x 768), enables real time, full motion, video-in-window, multi-board support for live video windows, integrated stereo audio controls, real time frame or field grabbing of live video window, arbitrary sizable (scalable) and positionable video window, and video window displayable in VGA resolution 800 x 600.
- The Pro Audio Spectrum Plus by Media Vision Co.: it is an audio package for PC multimedia with the functions of digital audio, MIDI sequencing, automated mixing, music, speech, ambience, and various sound effects. It can be augmented with a Sony CD-ROM drive.
- A Sony CD-ROM drive.
- Willow’s Laptop TV: it converts video signals from the computer into professional quality television signals. It enables one to view VGA graphics and animation (640 X 480) on a television or big screen projector, or record it on video cassette recorder.
**IconAuthor Authoring Package**

The software environment for the project requires a Microsoft Windows (Chinese version 3.1) as the preliminary interface. The authoring package used is IconAuthor (version 4.0). IconAuthor uses icons to represent the flow chart or structure of an application program. The application development process is completed when the content is added to each of the icons in the structure. In the IconAuthor environment, an application is created by performing two simple operations: building the structure of the application using icons, and adding content to the icons using dialogue boxes.

**Databases**

One of IconAuthor’s advantages is allowance of including database files so that a huge amount of data, very common in multimedia applications, can be accommodated in a structural and thus maintainable way. Currently the courseware we have developed has the following database files, which were built in database format.

<table>
<thead>
<tr>
<th>Database Files</th>
<th>Location and Purposes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. CAST.DBF</td>
<td>Subunit I B for description of cast in the film</td>
</tr>
<tr>
<td>2. DICTIONA.DBF</td>
<td>Unit 2 and Unit 3 for lookups of unknown words</td>
</tr>
<tr>
<td>3. TRANS.DBF</td>
<td>Unit 3 for both English and Chinese scripts</td>
</tr>
<tr>
<td>4. BK_INFO.DBF</td>
<td>Unit 3 for background information</td>
</tr>
<tr>
<td>5. GIST1.DBF</td>
<td>Unit 3 for the gist of the film</td>
</tr>
<tr>
<td>6. INSTRUCT.DBF</td>
<td>Unit 4 for textual information</td>
</tr>
<tr>
<td>7. RECORD.DBF</td>
<td>All the Units for CMI</td>
</tr>
<tr>
<td>8. HELPLOG.DBF</td>
<td>Unit 3 for CMI</td>
</tr>
<tr>
<td>9. UNTT3LOG.DBF</td>
<td>Unit 4 for CMI</td>
</tr>
</tbody>
</table>

The most time consuming databases to build are TRANS.DBF and DICTIONA.DBF because they are comprehensive and thus large. DICTIONA.DBF contains English and Chinese pairs of all the words or idioms used in the film or play script so when students encounter unknown words or idioms, they can look them up on-line. In Unit III, Viewing of Film, the English and Chinese scripts are stored in the TRANS.DBF database file, while the background information and gist are stored in BK_INFO.DBF and GIST1.DBF. The two pieces of information are coded by frame numbers like those in TRANS.DBF. However, since the background information and gists are not as extensive as the transcripts, a mechanism for calling the previous piece of information was programmed to fill the gaps.
Design of Templates

Based on the experience on Unit IV, Viewing of the Film with Instruction, four types of templates were designed. A template is like a subroutine in a procedural language context. It functions specifically but allows variation of some input variables so that it can be used repeatedly for a slightly different function. For example, a multiple choice question requires a question stem, some distractors, a correct answer, feedback for the correct answer, and feedback for incorrect answers. In procedural language, several multiple choice questions can be created with a loop. In IconAuthor, a template is designed: it consists of a set of icons and allows changes in different variables in the content of icons. The purpose of a template is more than repeated functions. A template can facilitate the process for lay teachers who know little about programming but may change the content of variables to customize the program for their pedagogical needs. Four types of templates with pseudo codes are listed in Table 5 below.

1. Show/Explanation
   a. play video frame range X - Y
   b. stop (wait for a key to go on)
   c. display a page of a Smart Text file with "explanation"

2. Multiple Choice Questions/Comprehension Check (limited with 3 choices)
   0. store correct answer — one of (a, b, c, or 1, 2, 3) to a variable
   a. play video frame range X - Y (optional)
   b. display Question and 3 Choices from a Smart Text file
   c. display correct or incorrect feedback with optional video playback (range X - Y)

3. Writing Exercise
   a. display instruction/cue
   b. play video frame range X - Y
   c. display prompt with 3 icons: Review (video), Check*, and Done (save the write-up and exit)
   d. play video range X - Y for reinforcement

4. Matching Exercise
   a. display instructions
   b. show 4 video segments with random order in full screen
   c. judge answer

Note: Where X, Y, Z are variables in iconware

* Right Writer, a grammar checking package, is included in the IconAuthor package to check readability of writing.

Table 5.
Details of Implementation

Regarding computer managed instruction (CMI), individualization of content, sequence, and pace are achieved through the following implementation. In the courseware, after the title page, the logon page is shown as the front end of CMI design, which records the student's identification number (ID #) and English name as well as starting date and time according to the system clock. Then, screens of instructions for the courseware appear; these can be skipped for learners who have used the program more than once. Each time, every user encounters the main menu (see Figure 5), which consists of a submenu regardless of entrance or exit. This design facilitates management of the instruction process because it follows the principle of one-entrance one-exit.

In Unit II, Hyperscript, the pages read by the students, the time for reading each page, and the words or idioms checked on each page, are recorded in the UNIT3LOG.DBF file. The total time for this activity is also recorded in the same file. Unit III, View of the Film starts with instruction. Again the total unit time, side time (this unit used 4 sides of the video material), the frame number while pressing PAUSE, FORWARD, BACKWARD, or HELP in the video controller, types of help — Chinese help on/off, English help on/off, idiom/word checked, background information help, gist help, repetition of the current utterance, or repetition of the previous sentence, frequency, and total time of help requested are recorded. In Unit IV, View of the Film with Instruction, all the student input is recorded, ranging from one answer for multiple choice questions to a set of answers for matching exercises and a writing passage. Internal processing in individualized instruction can be inferred from records in CMI databases, and advisement strategies will be implemented with some on-line text messages for student users at appropriate points.

By July 1 of 1993 there were 74 files in the Ghostbusters iconware, which included (a) 10 *.iw and 10 *.pth files — subroutines and paths, (b) 15 *.smt files — screen layouts for texts, (c) 9 database files as discussed above, (d) 19 files for graphics or digital video, (e) 11 animation files, and (f) 5 *.wav files for sound effects. The total number keeps increasing as the CMI section is still under coding at this writing. However, this can give a rough estimate of the size of the courseware.
LINKAGE TO THE CLASSROOM

CALL/IVD, like CAI, has its strength in individualized instruction as its design tends to adopt the merits of an adaptive system. The EFL IVD project is designed in an attempt to incorporate individual students' learning as flexibly as it can. Thus, the CALL/IVD workstations can be set up in various individual booths so that students can learn at their own pace without interfering with others. CALL/IVD, however, is not necessarily used only for individual learning. Various CALL scholars have called for cooperative learning because in this way students can learn from both CALL and their peers. The social aspect of language learning under such circumstances has a very constructive impact on the development of communicative competence (see, for example, Abraham and Liou 1991; Krauss 1990).

In addition, CALL/IVD does not have to become a stand alone activity outside of the regular classroom activities. With either of its Chinese or English scripts, the courseware can serve for both preview and review activities in language classes such as reading, listening, speaking, and even writing when integrated into classrooms. In using CALL/IVD, students can be assisted with off-line facilities, if necessary, such as note taking on paper or the use of an off-line dictionary. For example, a story reconstruction by means of sequence ordering features in the IVD courseware can be designed and used in the regular classroom. A group of students may discuss sequence possibilities, individual students give the order of scenes and the story, and when consensus is reached, a group story is created. The participants can create an additional picture for the story by making up a possible ending to the group story.

EVALUATION APPROACHES

The evaluation of an instructional system in either a formative or summative manner is very crucial during the development/revision stage, especially for IVD. The cost of IVD hardware is high compared with that of common personal computer facilities; thus, an evaluation of its effectiveness is essential for both teachers and administrators in terms of time and effort spent on courseware development and funds invested in its long term development.

In evaluating interactive CALL systems, hard vs. soft methods become the first consideration. What approach is appropriate for the courseware? A hard method, such as an experimental design, is used to ask how good a system is; this kind of method is commonly used after a series of formative evaluations have been done to know enough
about aspects of the courseware. Then a vigorous design is used to compare the courseware with others. Soft methods such as interviews and observations should come during the design refinement cycle. For example, soft methods such as protocol analysis (video recording of the on-line process) and interviews are time consuming due to the necessity to analyze the process of natural language data, but they are useful in isolating specific problem areas because verbal reports correspond to information that describes cognitive processes. By contrast, results from hard methods such as questionnaires and logging data analysis can produce quantitative results easily. Further, logging data analysis can be done without subject awareness. These hard methods are useful for limited purposes and need explanatory comments for the semantic parts (Yamagishi and Azuma 1987).

In the area of human factors, for instance, researchers try to replace the vague notion of 'user friendliness' with five measurable quality criteria: time to learn, speed of performance, rate of errors, subjective satisfaction, and retention over time. In context of CALL, time to learn how to operate the courseware and speed of performance may not be as important as in the field of a business or industry. Speed can be important if gains in learning are considered at the same time. The rate of errors which occur in operation may cause confusion and disorientation, which leads to unsatisfactory responses from learners; however, the rate of errors as types of target language input of learners to the system can become an agenda for CALL scholars' research because they are indicators of interlanguage development. The research on retention over time relies on empirical achievements of user/learner mental models (see e.g., Kramer and Schumacher 1987) because these models attempt to map learners' conceptual models onto systems. Some evidence indicates the mental models promote effect learning (e.g., Jih and Reeves 1992).

Early CALL/IVD research shows a partial picture of its effectiveness with sparse empirical data in English as a second language (ESL) settings. For instance, Watts (1989), in a study on CALL use of interactive video, reports that IVD provided a highly motivating and successful language learning experience, based on her research results and learner response. In a pre- post-test design of a comparison between IVD groups and non-IVD groups, Branvold, Chang, Probst, and Bennion (1986) found that (a) both groups had increased learning in areas of vocabulary, expression, and content; and (b) with the exception of expression, in which case the IVD group did significantly better, learning gains were the same for both groups. In addition, the IVD group rated the IVD
lab substantially more effective than the CAI and audiovisual labs, and showed much interest and high motivation in using the new delivery system.

While it seems simple to ask whether IVD is effective, the conclusive answer is hard to find, given a huge array of variables intervening between the communication between the IVD system and the user/learner. Chapelle and Jamieson (1989, 48) suggest that aspects of lessons, learning, and learners should be clearly defined to carry out a meaningful assessment of CALL effectiveness, because "examination of a single lesson will rarely reveal that it is good for every purpose or every student." For example, human factors, among other criteria, can serve as one component of courseware design under the category of lessons. Malone, Kirkpatrick, and Heasly (1984) raised a series of considerations, among which appropriate and relevant points were selected by the author.

- objective of evaluation
- test method: task analysis, error analysis, experiment, observation and measurement of actual performance, interview, survey, questionnaire
- appropriate test measure selected
- user friendliness (extent to which it directs the user on what to do next: keeps him informed as to where he is in the process, and what the computer is doing, is responsive to his needs, and provides procedures which are logical and efficient)
- information quality (availability, currency, accuracy)
- display quality
- display characteristics (symbol size, shape, color, density, etc.)
- data organization: meaningfulness of architecture (the architecture producing hierarchical levels of data specificity)
- dialogue: system response time (command modes, error messages, prompts, alerts, queries, etc.)
- procedures: accuracy, internal consistency, and sequencing
- data entry device characteristics
- documentation (hard copy manuals and aids, pp. 118-119)
For the current project, only an informal formative evaluation has been conducted on *Ghostbusters*. In early May of 1993, three Associate Professors and one Instructor in the Department of Foreign Languages at Tsing Hua University were asked to critique the courseware. The process took about two hours while the author demonstrated the project. Critiques emerged on various aspects: on-line instruction, on-line operation, checking of English transcripts, rationale of the design, and possible future research directions in the aspects of EFL learning in the Department. All the major comments were recorded for later revision. The major criticism was the instruction for the Hyperscript unit because the wording and operation were very confusing. It was decided that an animated simulation design would replace the text version. Another subunit suggested to be added is "About Ghostbusting." A specialist in SLA reading research suggested that words in similar semantic fields should be added to help build students' background knowledge. In early July of 1993, two Associate Professors and two Instructors were invited again to review an improved version of the project. Again, all the major comments were recorded for the second year research work. Summative evaluation and pilot testing by the target learners were planned as work for the second year research.

In the coming year, formal evaluation phases of this project target a comprehensive assessment of language learning in the CALL/IVD context. As suggested in Doughty (1991), SLA theory should be underscored in implementing a CALL/IVD project; conversely, a CALL/IVD platform should serve a databank for collecting empirical data to help uncover the mysteries of language learning. The second function of the IVD use has not been emphasized before in this paper because it is appropriate to be addressed here in the evaluation/research phase. In addition to being comprehensive in collecting data in the IVD setting, the results will aim to shed light on general SLA processes. Research questions on general effectiveness will be addressed in the following manner.

1. Are there particular courseware strategies better matched for a particular type of students (and thus more effective for them)?

2. In what context are any particular manners of use of courseware better in general for learning? For instance, individual learning vs. pair/group work. And then, for what language skills are those manners more effective?
As mentioned before, this project has two versions: one with “complete” learner control and one with strategy advice. Use of strategy advice will be one of the variables to be investigated when observing use of the courseware. In addition, background information about students will be collected to facilitate future analysis of the data. The criterion of evaluation, or independent variable will be mainly communicative competence to be accompanied with other measures which are significant in our context. It is believed that an IVD aided instructional setting with rich TL input and a high level of interactivity can be designed to create an environment where language can be acquired through communicative events such as exploration or personal experiences in addition to explanation and drill. In this way, the new educational technology has tremendous potential to fulfill the goals of communicative language teaching.

Thus, the evaluation approaches will vary according to what type of data we plan to elicit. The purpose is to find answers for a comprehensive picture about such IVD use in language learning contexts. Repeated evaluation and revision processes should go hand in hand in a spiral fashion; namely, the results of evaluation should be fed back to revision processes for further development as well as improvement.

CONCLUSION

In this paper, an attempt to apply the synthesized results from previous research on theories to actual development of courseware is demonstrated in an IVD project which aims to promote EFL learning in our institution. Further, instructional design and practical considerations for implementation of such multimedia courseware development are illustrated. As described above, there are some screen layouts and textual information which require refinement in the near future. Testing of use of the courseware will be done in the coming year. Effectiveness studies on the courseware and observational research on its use will be planned and conducted in the near future.

With respect to practical implications and recommendations for those who are interested in the development of multimedia courseware, two important issues are raised. First, the design of the ‘template’ for Unit IV of the IVD project promises a step further - unlike for CALL specialists - for layman language teachers who may have very limited experience in CALL, or rather, programming skills, but would like to use videodiscs in language classes. For quite a period in Taiwan, people have been excited about CALL but up to now few satisfying products have been available in the market. It
is certain that we need more CALL materials for all levels of students so that CALL can be integrated into the regular EFL curriculum. One of the possible solutions would be the design of authoring languages for CALL purposes or even templates like those which have been developed in the current project. Chinese or nativization is no longer a problem under Chinese Microsoft Windows 3.1. The challenges of programming should not intimidate language teachers if they have ready made templates to implement their CALL materials. The 'template" or authoring language direction should underscore not only multimedia CALL or IVD-based CALL but also many other phases of traditional CALL courseware development. The availability of 'templates" relies on how open minded and willing courseware developers in private companies, public schools, and research institutes are to share them with one another.

Secondly, courseware development involving multimedia (not to exclude traditional CALL) tends to be labor intensive and thus time consuming. A great many human resources are required for such an enterprise. The accomplishment of the current project involves two years time. For the first year, one associate professor in CALL and EFL teaching/learning worked with a part time undergraduate mathematics student assistant (who worked 6-8 hours per week). The year was devoted to mastery of the package, IconAuthor, the programmable videodisc player, the video interface card, and the audio interface card, as well as the development of a very small prototype IVD language project, Robin Hood.

The second year's achievement is what has been reported here; this involves one Associate Professor, two Instructors (all three are full time teachers), four undergraduate EFL student assistants and two graduate assistants (one in computer science and the other in mathematics) who worked 6 hours per week. Design of the screen layouts involving computer graphics, analysis of language data (such as transcribing, construction of the dictionary), and coding and testing of the programs took most of the time. Throughout the process, critiquing and refinement sometimes brought us great joy, especially after we saw the refined results.

Group rapport was an important factor for the project to succeed. Almost every one of the assistants was a student taught by the teachers in CALL or media production classes. Namely we shared the same interest and backgrounds. Once in a while, assistants would be asked to read relevant papers so that background knowledge could be accumulated. However, not every assistant worked throughout the project; some
turnover occurred due to personal factors. IconAuthor is not hard to learn (taking about two months for one who has basic computer literacy and is familiar with Windows), and fortunately the transition between old and new assistants was smooth during the progress of the project.

Hopefully this paper suggests a direction for those who will develop or use CALL multimedia/IVD material in the future.

NOTE

1 The details of the Robin Hood project were described in Liou (1992) while 2001 was an undergraduate student's term project while taking a CALL course.

REFERENCES


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